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Final

Site Inspection Addendum

Fort Meade Feasibility Study and Remedial Investigation/Site Inspection Fort George G. Meade, Maryland

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Prepared for:

U.S. ARMY ENVIRONMENTAL CENTER
ABERDEEN PROVING GROUND, MARYLAND 21010

Prepared by:

ARTHUR D. LITTLE, INC.
25 Acorn Park
Cambridge, Massachusetts 02140-2390

[redacted]

DECEMBER 1995

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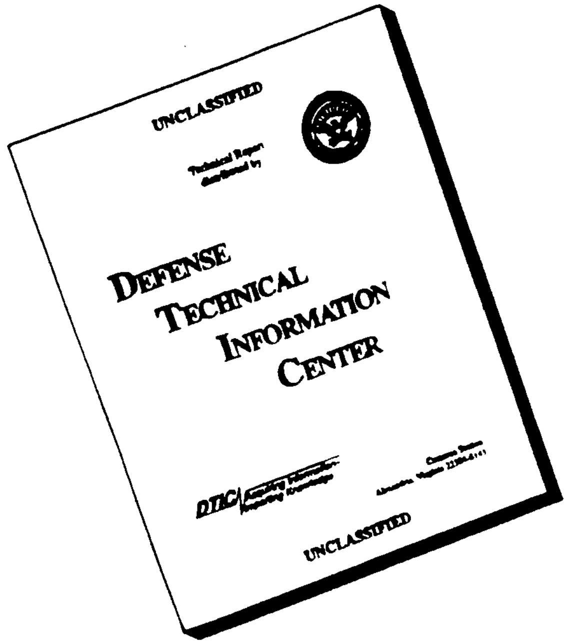

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Arthur D Little

Final Site Inspection Addendum

Fort Meade Feasibility Study and Remedial Investigation/Site Inspection Fort George G. Meade, Maryland

R N Lambe 12-19-95

Program Manager, Robert Lambe — Date

Kathleen Thrun 12/19/95

Task Manager, Kathleen Thrun — Date

Submitted to

U.S. Army Environmental Center (USAEC)
Aberdeen Proving Ground, Maryland

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Arthur D. Little, Inc.
Acorn Park
Cambridge, Massachusetts
02140-2390

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List of Acronyms and Abbreviations

ADL	Arthur D. Little, Inc.
AFFF	Aqueous Firm Forming Foam
ASL	Active Sanitary Landfill
ASTM	American Society for Testing and Materials
ATEC	ATEC Associates, Inc.
AWQC	Ambient Water Quality Criteria
BRAC	Base Realignment and Closure Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFD	Clean Fill Dump
CFR	Code of Federal Regulations
COC	Chain-of-Custody
COMAR	Code of Maryland Regulations
COR	Contracting Officer's Representative
CRL	Certified Reporting Limit
DCE	Dichloroethene
DPDO	Defense Property Disposal Office (currently known as DRMO)
DQO	Data Quality Objective
DRMO	Defense Reutilization and Marketing Office
DSY	DPDO Salvage Yard
ECD	Electron Capture Detector
EHSI	Environmental Hazards Specialists International, Inc.
EIS	Environmental Impact Statement
EMO	Environmental Management Office
EOD	Explosive Ordnance Disposal
EPA	United States Environmental Protection Agency
ER-L	Effects Range - low
ER-M	Effects Range - median
FGGM	Fort George G. Meade
FS	Feasibility Study
FSP	Field Sampling Plan
FTA	Fire Training Area
GC	Gas Chromatography
GFAA	Graphite Furnace Atomic Absorption Spectrophotometer
HNO_3	Nitric Acid
H_2SO_4	Sulfuric Acid
HCL	Hydrochloric Acid
HHA	Helicopter Hangar Area
HHRA	Human Health Risk Assessment
HNU	HNU Inc., Manufacturer of Photoionization Detector
HSA	Hollow Stem Auger

ID	Site Identification
IL	Inactive Landfill
IRDMIS	Installation Restoration Data Management Information System
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDNR	Maryland Department of Natural Resources
MGS	Maryland Geological Survey
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSL	Mean Sea Level
NA	Not Analyzed
NAD	North American Datum
NAPL	Non Aqueous Phase Liquid
ND	Not Detected
No.	Number
NOAA	National Oceanic and Atmospheric Administration
ODA	Ordnance Demolition Area
OSHA	Occupational Safety and Health Administration
PA	Preliminary Assessment
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
PID	Photoionization Detector
PWRC	Patuxent Wildlife Research Center
QA/QC	Quality Assurance/Quality Control
QAP	Quality Assurance Plan
QCP	Quality Control Plan
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
RI	Remedial Investigation
RIA	Remedial Investigation Addendum
ROD	Record of Decision
SI	Site Investigation
SIA	Site Investigation Addendum
SLI	Site Location Identity
SMCL	Secondary Maximum Contaminant Level
SOP	Standard Operating Procedure
SOW	Scope of Work
SPT	Standard Penetration Test
SVOC	Semivolatile Organic Compound
SW	Solid Waste
TAL	Target Analyte List
TCA	Trichloroethane
TCE	Trichloroethene
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure

TDS	Total Dissolved Solids
TEPS	Total Environmental Program Support
TIC	Tentatively Identified Compound
TPHC	Total Petroleum Hydrocarbons
USACE	U.S. Army Corps of Engineers
USAEC	United States Army Environmental Center
USAEHA	U.S. Army Environmental Hygiene Agency
USATHAMA	United States Army Toxic and Hazardous Materials Agency
USC	Unique Sample Code
USCS	Unified Soil Classification System
UST	Underground Storage Tank
UTM	Universal Transverse Mercator
UV	Ultraviolet
UXO	Unexploded Ordnance
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound

Executive Summary

This Site Investigation Addendum (SIA) Report was prepared as part of the SIA investigation conducted by Arthur D. Little, Inc., for the U.S. Army Environmental Center (USAEC) at the Fort George G. Meade (FGGM) Army base in Anne Arundel County, Maryland. The principal objective of this investigation was to evaluate the potential for chemical releases or contamination in suspected areas and to address data gaps identified during the 1990 Site Investigation (SI). Six sites were included in the SIA as having data gaps that required addressing: the DPDO Salvage Yard (currently known as the DRMO) and Transformer Storage Area (DSY), the Fire Training Area (FTA), the Helicopter Hangar Area (HHA), Inactive Landfill No. 2 (IL2), the Ordnance Demolition Area (ODA), and Soldiers Lake (SL).

The following tasks were performed to complete the SIA:

- Review of documents provided by USAEC containing information regarding historical activities and investigations at each site
- Completion of nine soil borings: two at the DSY, three at the FTA, one at the HHA, and three at the ODA
- Installation and development of nine ground water monitoring wells: two at the DSY, three at the FTA, one at the HHA, and three at the ODA
- Collection of surface water/sediment samples: five surface water/sediment pairs at the HHA, and two surface waters at SL.
- A location and elevation land survey of all new monitoring well locations
- Collection of water level measurements from newly installed monitoring wells at each site and the existing monitoring wells and piezometers
- Collection and analysis of soil and ground water samples in areas of concern as well as background locations at each site
- Review and interpretation of analytical results
- Identification of data gaps
- Reduction and review of all data obtained during the investigation, generation of figures and tables, and completion of the SIA report

The principal findings from this investigation are as follows:

- DPDO Salvage Yard and Transformer Storage Area: Halogenated volatile organic compounds (VOCs) continue to be detected in the shallow monitoring wells located along the southern boundary of the property. The source and extent of the contamination is still not known. A significant difference in depth to ground water between the westernmost sampling point -- location of highest VOC concentrations -- and neighboring monitoring wells makes it difficult to interpret the direction of ground water flow with certainty. Low concentrations of PCBs

were detected in the transformer storage area; however, these results do not reflect the concentrations detected during a previous investigation.

- Fire Training Area: VOC and metals contamination in the downgradient sampling location indicate that fire fighting activities have impacted the ground water quality. The extent of contamination is not known. The primary direction of ground water flow could not be determined with any degree of certainty because of the shallow gradient.

- Helicopter Hangar Area: Surface water and sediment data indicate that the HHA is not impacting the Little Patuxent River. The surface water data are below Ambient Water Quality Criteria (AWQC); the sediment data are below National Oceanic and Atmospheric Administration (NOAA) guidelines.

  Multiple sources may exist for ground water. Petroleum related compounds are present particularly in the area of the former underground storage tanks (USTs). Closer to the hangar, metals are also present in ground water at concentrations above maximum contaminant levels (MCLs).

- Inactive Landfill No. 2: Total metals continue to exceed their MCLs in ground water. The number of MCL exceedences increased from the SI to the SIA. It is not understood whether this increase is due to seasonal or natural variability. Concentrations increase downgradient of the source, indicating contaminant migration.

- Ordnance Demolition Area: VOCs and secondary explosives are present in the ground water above MCLs and Health Advisory limits. There is evidence that these compounds are migrating toward the south in ground water. The source of the VOC contamination is not known. The extent of the VOC or explosives contamination has not been defined.

- Soldiers Lake: Metals and pesticides are present in surface water at Soldiers Lake. The metals are generally within previous ranges and none exceed AWQC. The pesticides are present at low concentration and have decreased from the SI.

The USAEC is conducting Remedial Investigations at the DPDO, FTA, HHA, IL2, and ODA which will include detailed evaluations of site conditions. Work plans for these efforts are expected to be released inMay and October 1995, and detail the sampling and analysis programs for the sites. Although not addressed within this study, a Remedial Investigation/Feasibility Study will be conducted at Inactive Landfill 1 and Inactive Landfill 3.

1.0 Introduction

1.1 Purpose of Report

This Site Inspection Addendum Report has been prepared to address the Site Inspection portion of the Feasibility Study (FS) and Remedial Investigation/Site Inspection (RI/SI) activities at Fort George G. Meade. It has been prepared under Delivery Order No. 009 and a Change Order dated July 15, 1993, for the U.S. Army Environmental Center (USAEC), formerly known as the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). This report fulfills the requirements of deliverable ELIN A004 under Delivery Order 0009 of the Total Environmental Program Support (TEPS) contract DAAA15-91-D-0016.

The purpose of this Site Inspection Addendum (SIA) report is to report the findings of Arthur D. Little's SIA investigation. The overall purpose of an SI is to evaluate if chemical releases or potential contamination has occurred at suspected sites and to determine if further investigation is warranted. This study is an addendum to a previous SI and addresses data gaps remaining from or identified in that document. Six sites at Fort George G. Meade (FGGM) are included in the SIA:

- DPDO Salvage Yard and Transformer Storage Area
- Fire Training Area
- Helicopter Hangar Area
- Inactive Landfill No. 2
- Ordnance Demolition Area
- Soldiers Lake

A second study, a Remedial Investigation Addendum (RIA) was conducted concurrently with the SIA. Two sites, the Active Sanitary Landfill and the Clean Fill Dump, are included in that study. The results of the RIA are reported in a separate document. However, some basewide data, such as geology, general hydrogeology, and background soil concentrations, are reported in both reports.

Because this document is an addendum to the original SI (EA Engineering, Science and Technology, 1992), it does not include all the data from that document. When appropriate, data from the SI are summarized here or are used for comparison with the newer data. However, for a complete account of the SI, refer to that document.

1.2 Site Background

1.2.1 Site Location and General Description

FGGM is located in Anne Arundel County, Maryland, between Washington, D.C., and Baltimore, Maryland (Figure 1-1), and includes approximately 13,000 acres. The closest town is Laurel, Maryland, located less than five miles to the west.

The Baltimore-Washington Parkway and Route 197 are located west and south of FGGM, respectively. Route 198 runs across the facility east to west and Route 175 cuts across the facility's northeast corner. The Baltimore and Ohio Railroad has tracks across FGGM's northern half and Amtrak rails run along the southeast border. The Universal Transverse Mercator (UTM) coordinates, for zone 18, for the furthest extents of the base are 4332400 north, 0352100 east, 4321900 south, and 0341600 west (USCS, 1979; Defense Mapping Agency, 1976).

The base has been a permanent U.S. Army installation since 1917. The installation contains administration, recreational, and housing facilities, as well as limited training areas and firing/combat ranges. The FGGM community consists of a residential population and daytime work force of approximately 20,000 (EA Engineering, Science and Technology, 1992).

Five sites are in the SIA. Table 1-1 summarizes their names, abbreviations, and location on the base. The sites are shown on Figure 1-2.

1.2.2 Site History and Previous Investigations

In 1988, the U.S. Army Base Realignment and Closure Act (BRAC) recommended that 9,000 acres of the 13,000-acre facility be closed or excessed. This 9,000-acre area encompassed the southernmost two-thirds of the installation. On October 1, 1991, the Army transferred 7,600 of the 9,000 acres to the Department of the Interior, specifically the Patuxent Wildlife Research Center (PWRC) (Argonne National Laboratory, 1989). The remaining 1,400 acres proposed to be excessed consist of approximately 1.000 acres of woodlands and wetlands and approximately 400 acres associated with the Tipton Army Airfield. An additional 500 acres are proposed for transfer to the PWRC; however, this transfer has not yet been completed. There has been no determination yet about the transfer of the Tipton Army Airfield and additional acreage. Figure 1-2 shows the 7,600 acres transferred to PWRC and 500 acres proposed for transfer.

Numerous environmental investigations have been conducted at FGGM since BRAC, including an Enhanced Preliminary Assessment (Argonne National Laboratory, 1989), a study by the Maryland Department of Natural Resources (MDNR), an Environmental Impact Statement (EIS) (draft and final) (Rogers et al., 1990, 1991), a Wetland Identification Study (RGH/CH2M Hill, 1991), a Remedial Investigation (EA

Engineering, Science and Technology, 1992a), and a Site Inspection Study (EA Engineering, Science and Technology, 1992b).

The Enhanced PA includes a review of all available records related to air, soil, surface water, and ground water, and identifies six areas of concern at FGGM: active and inactive landfills, underground storage tanks, asbestos, unexploded ordnance, surface water, and burning grounds.

MDNR conducted an evaluation of the surplus property in January 1990. The study describes the natural features and land uses associated with the 9,000 acres to be excessed from FGGM and discusses the degree of development of the retained land.

In January 1990, an EIS for FGGM, Fort Holabird, Maryland, and Fort Belvoir, Virginia, was prepared by Rogers, Golden & Halpern, Inc. (RGH). The EIS focuses on the affected environmental areas of these installations. The EIS describes the existing conditions of FGGM's 9,000 acres slated to be excessed and evaluates the consequences of the use/reuse scenarios.

In January 1991, a wetland identification study was prepared by RGH/CH2M Hill, Inc. to complete the study of the closure and use/reuse alternatives for the 9,000-acre parcel at FGGM (RGH/CH2M Hill, January 1991). The report describes the methods used to identify wetlands on the parcel and presents a map of wetlands distribution.

A Final EIS for the comprehensive base realignment and partial closure for FGGM and Fort Holabird was prepared by the U.S. Army Corps of Engineers, Baltimore District, in July 1991. This report focuses on the environmental and socioeconomic impacts associated with the planned base realignment and partial closure at FGGM and Fort Holabird. The EIS covers only 1,400 acres of the 9,000-acre parcel at FGGM; the remainder of the parcel was awaiting transferral to the PWRC at the time of the final report.

A Draft Remedial Investigation (RI) report was prepared by EA Engineering, Science and Technology, Inc. in November 1991. The RI focuses on the active sanitary landfill (ASL) and the clean fill dump (CFD). The final RI was completed in October 1992 (EA, October 1992).

A Draft Site Inspection (SI) report was submitted by EA Engineering, Science and Technology in January 1992. This report discusses conditions at the helicopter hangar area (HHA), four inactive landfills, the DPDO salvage yard (DSY), the fire training area (FTA), the ordnance demolition area (ODA), underground storage tanks, and asbestos. The final SI was submitted in October 1992 (EA, October 1992).

1.2.3 Site Description

1.2.3.1 Physiography and Surface Water. FGGM is located in the Atlantic Coastal Plain physiographic province, which is characterized by low rolling uplands and low-gradient streams. The Coastal Plain is underlain by a thick wedge of unconsolidated sediments that dip and thicken to the southeast. The sediment wedge thins to the west along the "fall line," the line separating the Coastal Plain and Piedmont geographic provinces. The land surface elevation at FGGM ranges from approximately 65 to 300 feet.

FGGM is located in the Patuxent River watershed. The Little Patuxent River flows southeast across FGGM along a broad, flat river valley with extensive wetlands. The Little Patuxent flows across the northeastern corner of FGGM and into the Patuxent River, which eventually empties into the Chesapeake Bay.

The Little Patuxent flows along the borders of two SIA and one RIA sites: the HHA, the IL2, and the CFD. The Midway and the Franklin Branches of the Little Patuxent flow south across the northern half of the facility and join to form the Rogue Harbor Branch. Several other unnamed tributaries flow across the site.

Quaternary river terrace deposits are present in some areas of FGGM and consist primarily of interbedded sand and gravel with some silt and clay. The terrace deposits are found near the CFD at an average thickness of 25 feet. Marsh deposits are also found at the installation and include interbedded silt, clay, and sand with organic matter.

There are two lakes at FGGM: Burba Lake is located along the Franklin Branch and Soldiers Lake is located along the Rogue Harbor Branch. There are also two small surface water retention ponds at the base of the ASL.

1.2.3.2 Surficial and Bedrock Geology. The Costal Plain province is characterized by a thick wedge of unconsolidated coastal sediments that were deposited from the Triassic to the Quaternary geologic periods. The formations that make up the wedge dip toward the southeast and outcrop in roughly north-south trending bands (Maryland Geologic Survey, 1968). Regional geology is illustrated on Figure 1-3.

The unconsolidated deposits present at FGGM are from the Potomac Group. The Potomac Group consists of, from youngest to oldest, the Patapsco, Arundel, and Patuxent Formations, for a total thickness of approximately 600 feet. The formations were formed as fluvial and lacustrine deposits and consist of interbedded sand, silt, and clay layers. A stratigraphic column for Anne Arundel County is shown in Figure 1-4.

Based on site drilling logs, primarily from the ASL, the upper section of the Patapsco Formation consists of mottled, medium fine to silty sand in various colors: yellow brown, yellow orange, light brown, and gray. The thickness of this layer ranges from 1 to 40 feet at the ASL. This upper section of the Patapsco is not continuous across FGGM and appears to pinch out along the western portion of the ASL. It is likely, based on drilling logs and relative spacial position, that the wells at the ODA are also screened in the upper Patapsco.

A fairly sharp contact exists between the upper and middle sections of the Patapsco Formation. The middle section of the Patapsco Formation is a thick, hard, highly plastic, mottled clay. Depth to the clay layer ranges from 1 to 40 feet below grade. The middle section is very close (<5 feet) to the ground surface along the western boundary of the ASL and along the stream flowing west from the ASL. The proximity of the surface of the middle section to the ground surface indicates that the upper section is pinching out. The middle layer has a mean thickness of 50 feet and ranges up to at least 102 feet at the ASL, where it was completely penetrated. Lenses of very fine silty sand, varying from 2 to 16 feet in thickness, are not uncommon in the middle section.

The transition between the middle and lower sections of the Patapsco Formation is fairly gradual. There is approximately 15 feet of alternating silty sands and silty clays before the transition to the lower Patapsco (medium fine sand with trace clay). The lower section of the Patapsco Formation is a medium fine, silty sand that grades downward into a coarse medium sand with minor silt. The colors observed in this layer include pale to dark yellowish orange, dark brown, and dark yellow. The soil boring logs from the deep wells at the ASL and the shallow wells at the FTA and DSY are representative of this layer. The reported regional thickness ranges from 80 to 100 feet. Depth to the layer at FGGM is approximately 45 feet below grade.

The Arundel Formation is approximately 250 feet thick and consists of massive beds of red, brown and gray clay with more permeable layers in some areas.

The Patuxent Formation is the oldest of the unconsolidated deposits and is composed of sand and gravel with some silty clay and clay. This formation is the shallow layer along the western boundary of FGGM and lies above crystalline bedrock. The Patuxent, like the rest of the unconsolidated deposits, slopes to the southeast.

The Patuxent Formation rests unconformably above crystalline bedrock. The bedrock, which is Precambrian to early Cambrian, consists of igneous and metamorphic rocks (Hansen and Edwards, 1986). The bedrock outcrops in the Piedmont region northwest of the base. The primary rock types found along the fall line are metavolcanics such as amphibolite, schist, and serpentinite, and belong to the Baltimore Mafic Complex.

In summary, FGGM is underlain by a wedge of unconsolidated deposits that thicken and dip to the southeast. The deposits include alternating formations of sand and gravel with silty clays. Underlying the wedge is Precambrian to early Cambrian crystalline bedrock. Depth to bedrock at FGGM is unknown and varies regionally.

1.2.3.3 Hydrogeology. The Potomac Group is composed of three separate and distinct aquifers in the vicinity of the base. The aquifers are known as the upper and lower Patapsco and the Patuxent aquifers. The middle confining layer of the Patapsco Formation and the Arundel Formation act as confining layers separating each of the aquifers (Figure 1-5). All three aquifers are confined on a regional scale but act as water table aquifers in areas where the confining layers do not exist.

The upper Patapsco, where it exists at FGGM, is an unconfined water table aquifer. This layer is present at the ASL but has not been identified at other sites at FGGM. It may be present at the CFD, but the identification has not been confirmed. The regional direction of ground water flow is to the southeast. However, due to mounding, ground water flow in the upper Patapsco at the ASL varies with the topography and can be east, south, or west. The hydraulic conductivity for this aquifer, measured at the ASL, ranges from $3x10^{-5}$ to $6x10^{-3}$ cm/sec. The mean water level elevation at the ASL is 145 feet above mean sea level (MSL).

The clay layer in the Patapsco forms the middle confining bed separating the upper and lower Patapsco aquifers. The vertical hydraulic conductivity, for samples collected at the ASL, ranges from $1x10^{-8}$ to $2x10^{-7}$ cm/sec.

The lower sandy layer of the Patapsco forms the lower Patapsco aquifer. This aquifer acts both as a water table (unconfined) aquifer and as a confined aquifer depending on whether the upper Patapsco aquifer is present. At the ASL, where the upper Patapsco is present, the lower Patapsco is a confined aquifer. At the DSY and IL2, where the upper Patapsco is not present, the lower Patapsco acts as a water table aquifer. Regional ground water flow in the lower Patapsco aquifer is toward the southeast, consistent with the formational dip. On site, the ground water flow direction varies. In the confined portion of the aquifer at the ASL, the lower Patapsco flows to the southeast, consistent with the regional direction. In the water table portions of the aquifer, the flow direction varies depending on site topography and surface water locations. Hydraulic conductivities range from $4x10^{-4}$ to $2x10^{-3}$ cm/sec in the confined portions and from $1x10^{-4}$ to $2x10^{-2}$ cm/sec in the unconfined portions.

The Arundel Formation acts as a confining bed between the lower Patapsco and the Patuxent aquifers. The Arundel has a low vertical permeability.

The Patuxent Formation forms the lower confined aquifer. The Patuxent aquifer has been identified as a confined aquifer for all sites at FGGM where encountered. Based on regional geology, it is likely that the Patuxent aquifer exists under water table conditions west of the base, but is unlikely to do so at FGGM. Regional ground water flow in the Patuxent is toward the southeast, consistent with the regional dip. Because few of the wells at FGGM are in the Patuxent aquifer, no ground water contour map has been constructed.

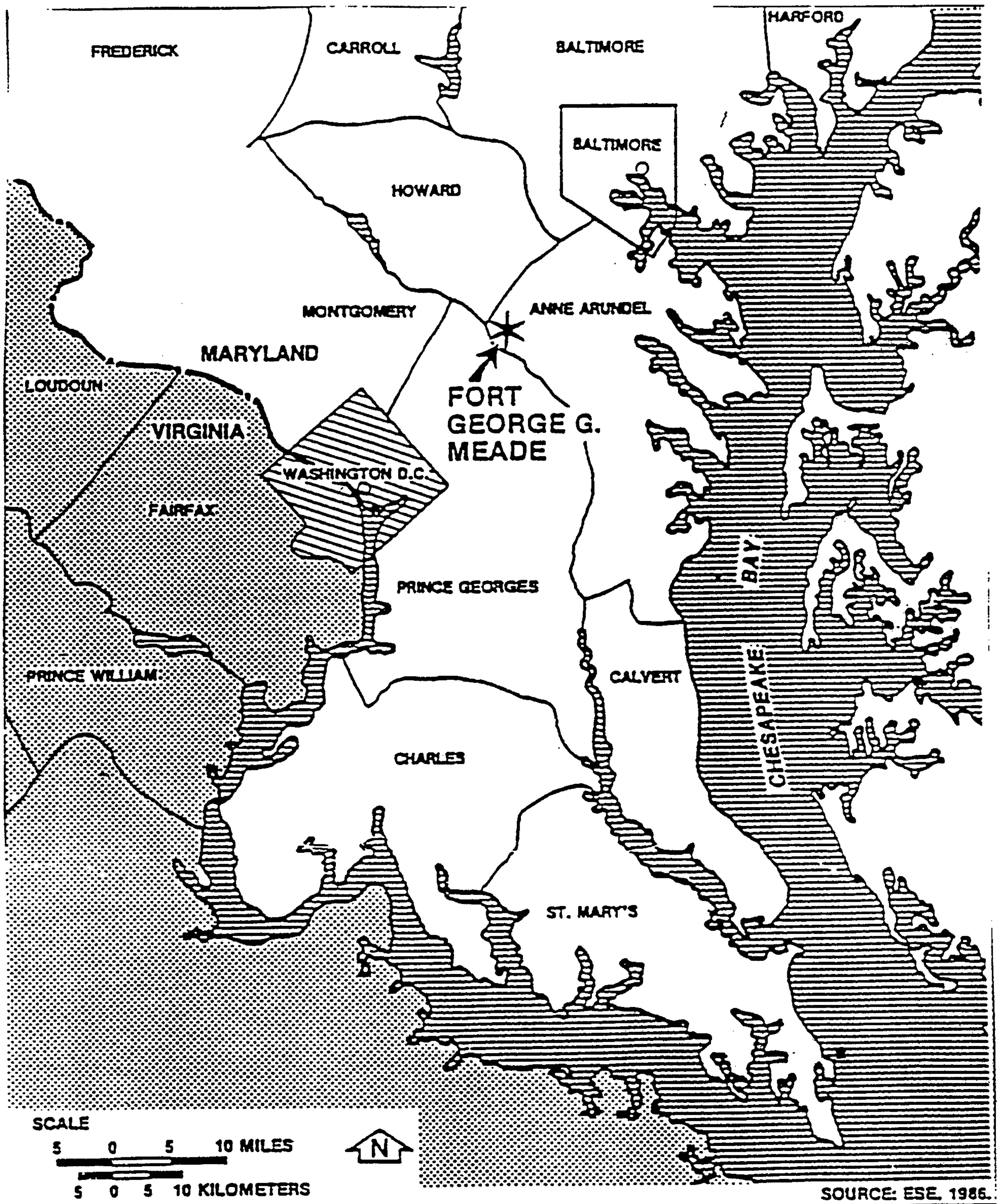
According to the Maryland Geological Survey (Mack and Achmet, 1986), the bedrock in Anne Arundel County is expected to be similar to the low hydraulic conductivity bedrock in the Piedmont region.

1.3 Report Organization

The format of this report is as follows:

- Section 1.0: Introduction - Background and basewide information
- Section 2.0: Technical Scope of Work and Investigation Objectives and Procedures - Detailed rationale and procedures for the completed SIA data collection activities
- Section 3.0: Basewide Investigation - Information related to all sites, such as appropriate regulations, quality assurance, and background soil chemistry
- Sections 4.0 through 9.0: Physical Characterization and Contaminant Assessment. Data collected during the SIA, conclusions, and recommendations for each SIA area at FGGM:

  Section 4.0 DPDO Salvage Yard and Transformer Storage Area
  Section 5.0 Fire Training Area
  Section 6.0 Helicopter Hangar Area
  Section 7.0 Inactive Landfill No. 2
  Section 8.0 Ordnance Demolition Area
  Section 9.0 Soldiers Lake



PREPARED FOR: USAEC				TITLE: Figure 1-1: Fort George G. Meade Regional Location Map
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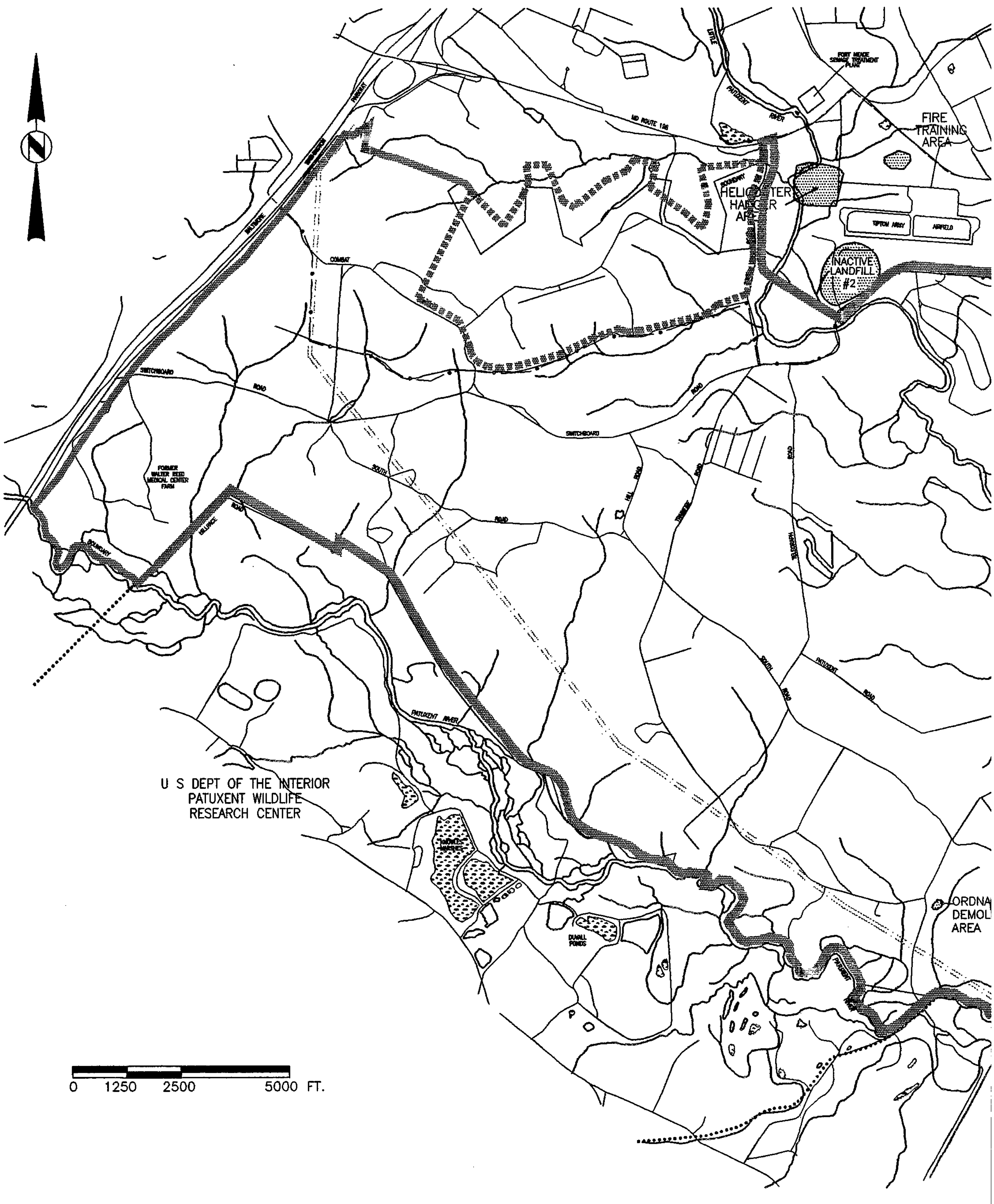

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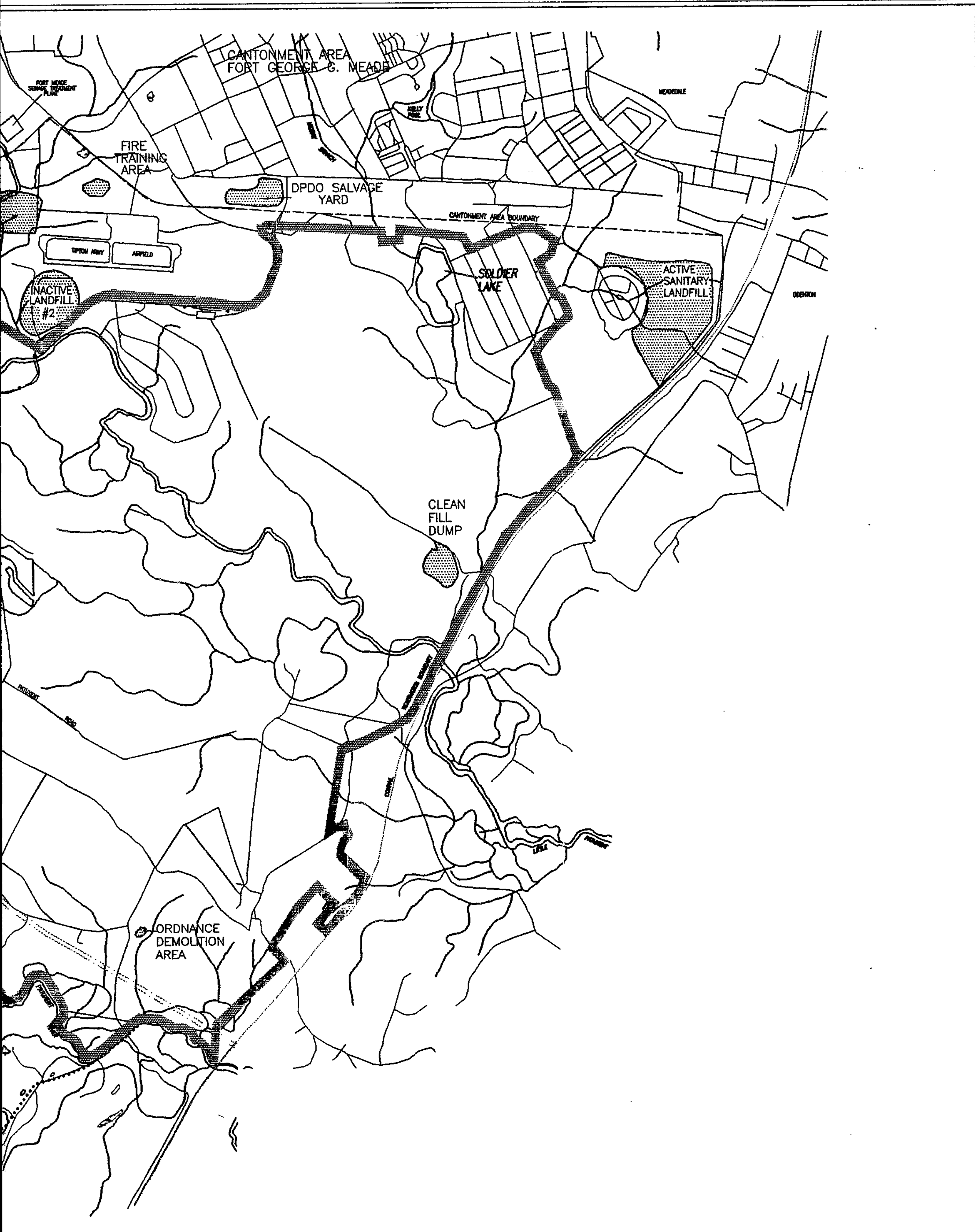

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TITLE: FIGURE 1-2: LOCATION OF SITES AT FORT GEORGE G. MEADE

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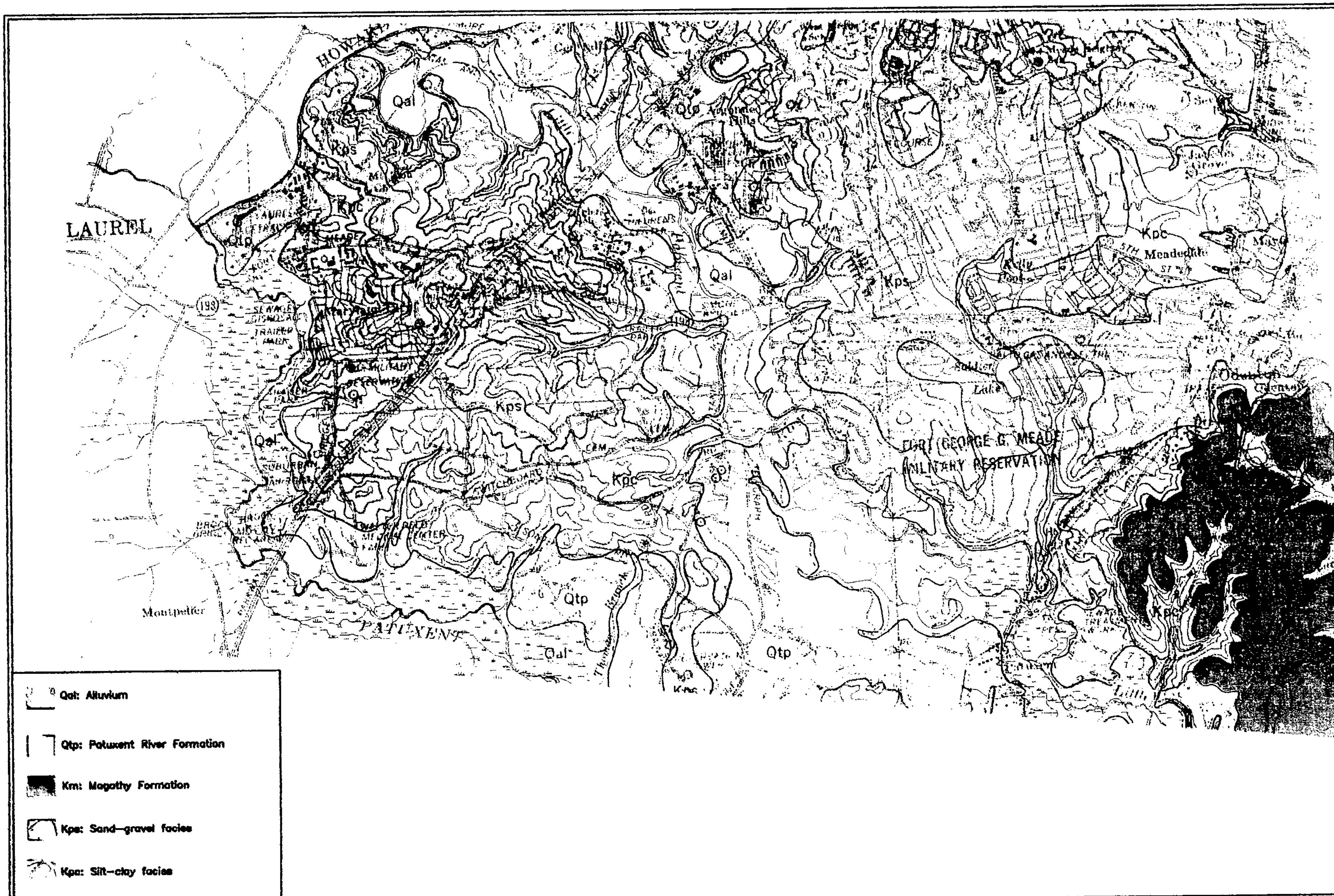

PREPARED FOR: USAEC			SOURCE: GLASER, 1976. GEOLOGIC MAP OF ANNE ARUNDEL COUNTY.	Arthur D Little	TITLE: Figure 1-3: Fort George G. Meade Regional Geology Map
DATE: NOV. 1992	SCALE: AS SHOWN	DWG. NO. FIG2-6			

Figure 1-4: Stratigraphic Column for Anne Arundel County

System	Series	Group	Formation	Average Thickness	Hydrologic Character	General Lithology
QUATERNARY	HOLOCENE and PLEISTOCENE		Alluvium and terrace deposits	30	Confining bed in most places. Poor aquifer in some places.	Sand, gravel, silt, and clay.
TERTIARY	EOCENE	PAMUNKEY	Nanjemoy Formation	80	Confining Bed	Sand, with clayey layers, glauconitic.
			Marlboro Clay	30	Confining bed.	Clay, plastic, pale-red to silvery gray.
	PALEOCENE		Aquia Formation	100	Aquifer	Glauconitic, greenish to brown sand with indurated or "rock" layers in middle and basal parts.
			Brightseat Formation	40	Confining bed in most places. Poor aquifer in some places.	Sand, silt, and clay, olive gray to black, glauconitic.
CRETACEOUS	UPPER CRETACEOUS		Severn Formation	90	Poor aquifer in places.	Sand, silty to fine, with some glauconite.
			Matawan Formation	30	Confining bed	Silt and fine sand, clayey, dark gray to black, glauconitic.
			Magothy Formation	100	Aquifer	Sand, light gray to white, with inter-bedded thin layers of organic black clay.
	LOWER CRETACEOUS	POTOMAC	Upper Part	250	Confining bed	Clay, tough, variegated color.
					Aquifer	Sand, fine to medium, brown color.
			Lower Part	250	Confining bed	Clay, tough, variegated color.
					Aquifer	Sand, fine to medium, brown color.
			Arundel Clay	250 (?)	Confining bed	Clay, red, brown, and gray, contains some ironstone nodules and plant remains.
			Patuxent Formation	250 (?)	Aquifer ? Confining Bed Aquifer ?	Sand, gray and yellow, with interbedded clay; kaolinized feldspar and lignite common. Locally clay layers predominate.
LOWER PALEOZOIC (?) to PRECAMBRIAN (?)			Basement[1] Complex	Unknown	Confining bed	Probably gneiss, granite, gabbro, meta-gabbro, quartz diorite and granitized schist.

1 Consolidated red shaly rocks of Triassic(?) age were drilled at Sandy Point State Park.

Source: Mack and Achmad. 1986. *Evaluation of the Water-Supply Potential of Aquifers in the Potomac Group of Anne Arundel County, Maryland.* Maryland Geological Survey, Report of Investigations No. 46.

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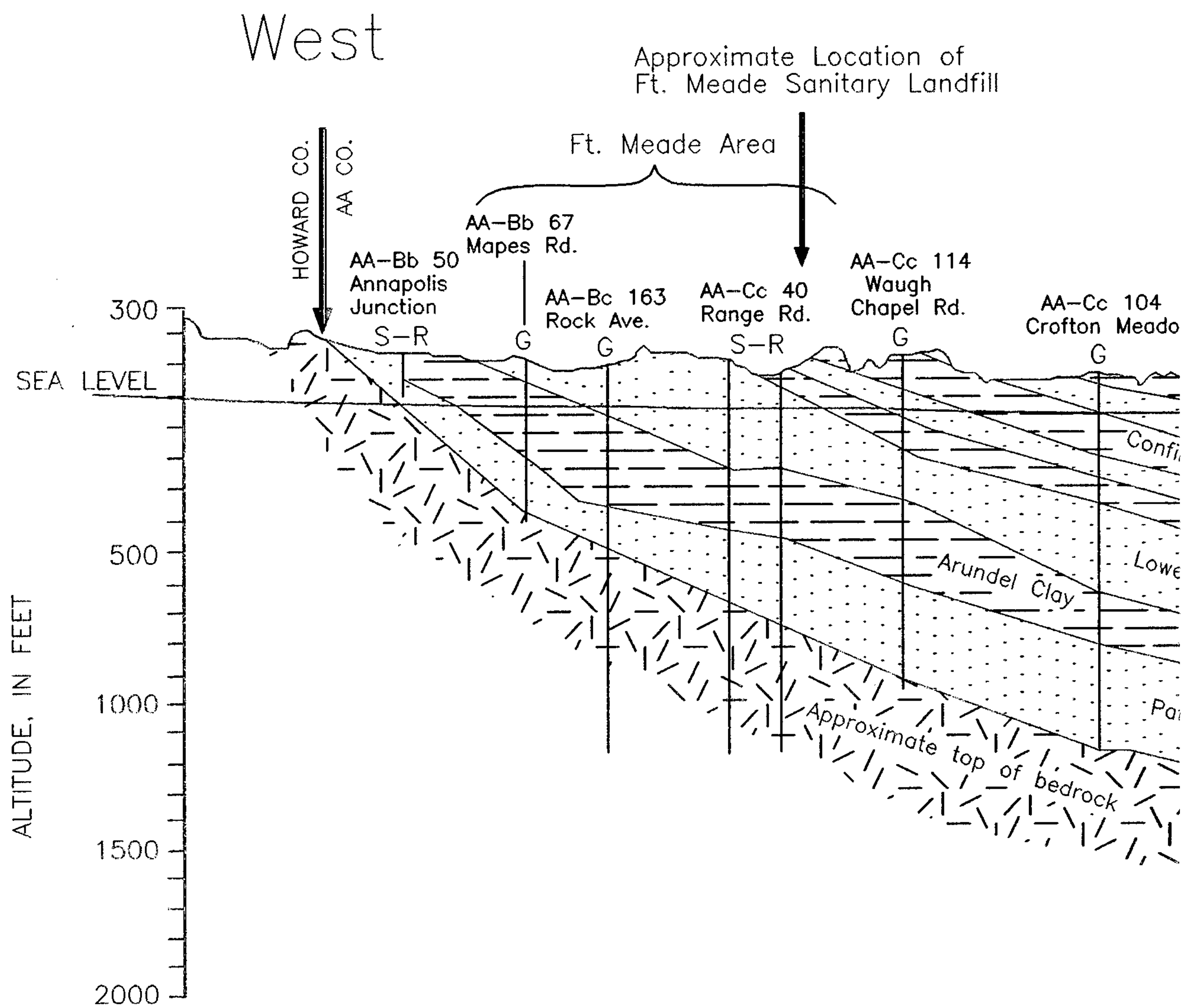
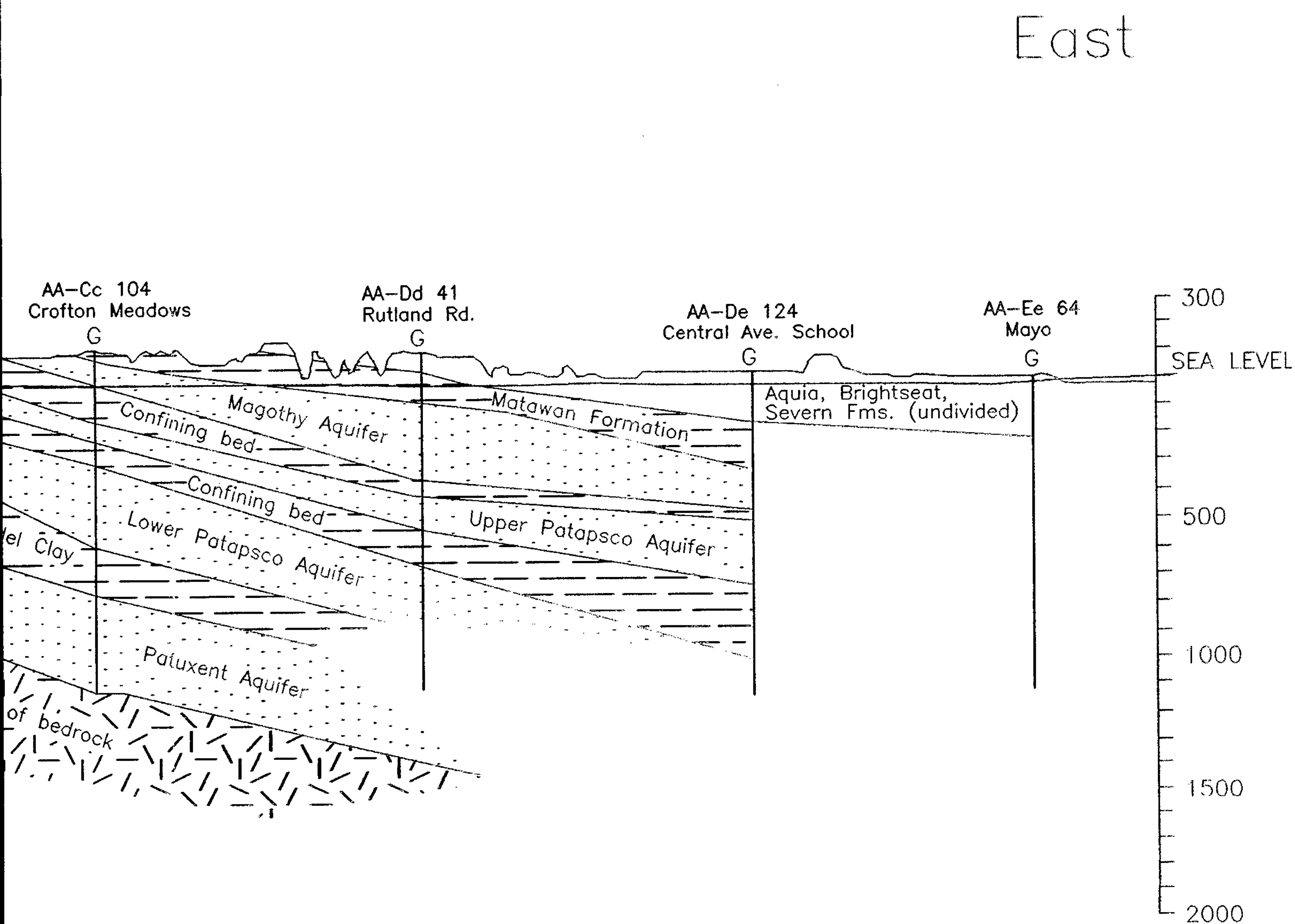


LEGEND
G – GAMNA RAY LOG
S – SPONTANEOUS POTENTIAL LOG
R – RESISTIVITY LOG

(2)



Arthur D Little		TITLE FIGURE 1–5 HYDROGEOLOGIC CROSS–SECTION ACRO ANNE ARUNDEL COUNTY	
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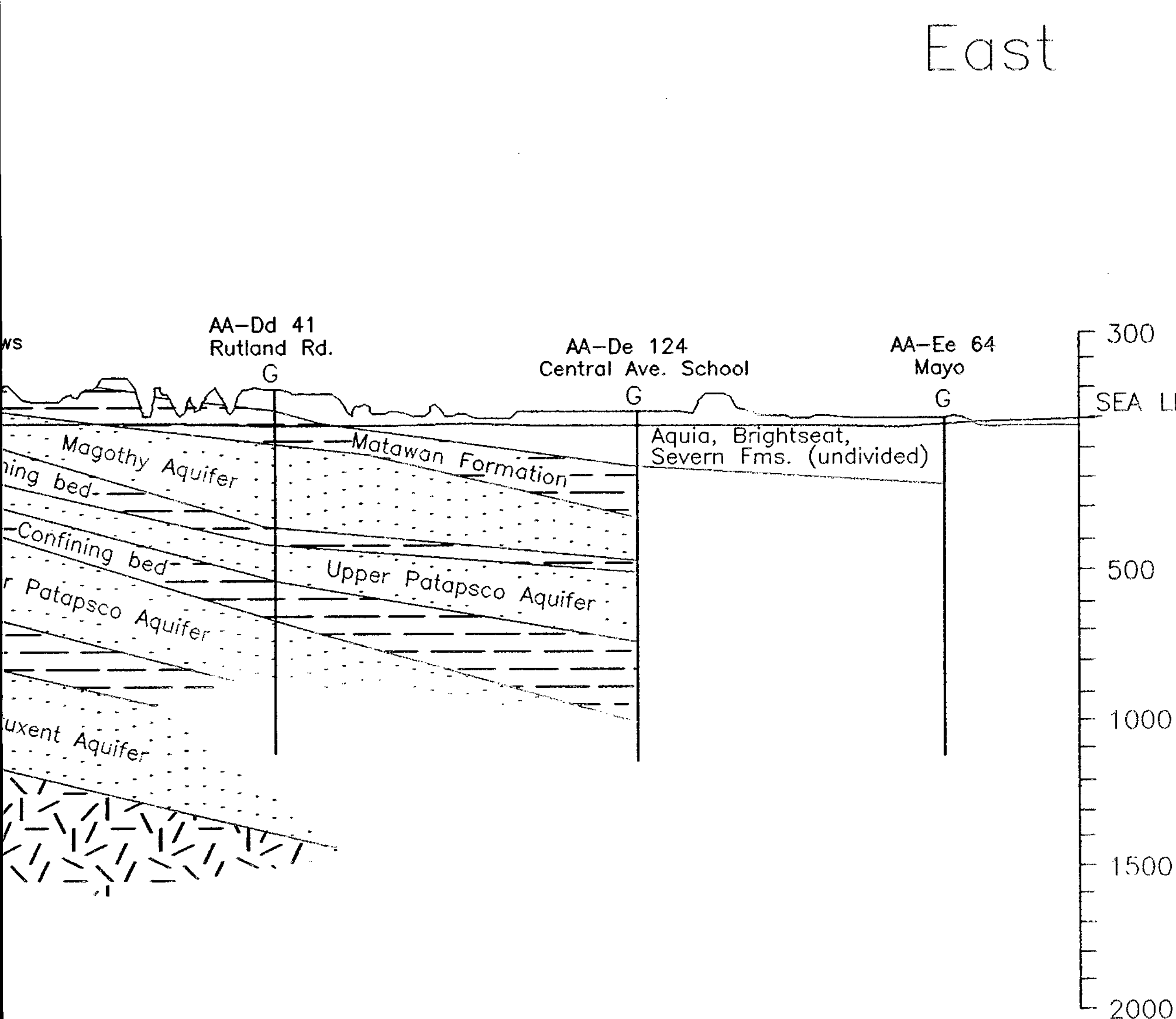

Arthur D Little		TITLE: FIGURE 1–5 HYDROGEOLOGIC CROSS–SECTION ACROSS ANNE ARUNDEL COUNTY	
APPROVALS	DATE		
DRAWN		PREPARED FOR: USAEC	SCALE: AS SHOWN
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QA/CONTROL		DATE: APRIL 1995	DWG. NO.: CROSS
TECH REVIEW			
PROJ MNGR		SOURCE: MACK AND ACHMAD, 1986	SHEET 1 OF 1

Table 1-1: Location of Site Inspection Addendum Sites

Site Name	Site Abbr.	Location on Base
Inactive Landfill No. 2	IL2	South of Tipton Airfield and about 450 feet north of Little Patuxent River.
DPDO Salvage Yard and Transformer Storage Area	DSY	Immediately north of Route 32.
Helicopter Hangar Area	HHA	West of Tipton Airfield.
Fire Training Area	FTA	North of Tipton Airfield.
Ordnance Demolition Area	ODA	Southeast corner of the parcel at Range 16.
Soldiers Lake	SL	South of Route 32 and approximately one mile west of the BRAC parcels eastern boundary.

NOTES:

Abbr. - Abbreviation

2.0 Technical Scope of Work and Investigation Objectives and Procedures

2.1 Technical Scope of Work

The purpose of the SIA field investigation was to collect sufficient data to determine if chemical releases or contamination have occurred at suspected sites, and/or to further investigate areas of potential concern.

Each of the field tasks was conducted to evaluate potential problems or to fulfill an existing data gap. Data gaps and the rationales for the field tasks are included on Table 2-1. Figure 2-1 summarizes the entire SIA technical scope of work (SOW) as it was completed. Detailed descriptions of the SOWs and any deviations from the proposed SOW for each area are included in Sections 4.0 through 8.0.

The general objectives for each type of field procedures are included in Section 2.2. Summaries of the procedural methods are included in Section 2.3.

2.2 Investigative Objectives

2.2.1 Surface Water and Sediment Investigation

A surface water and sediment sampling program was conducted to evaluate the distribution and potential impact, if any, of migrating contaminants into the surface water or sediment. Surface water samples were collected to determine if source constituents have migrated into the surface water regime. The interaction between source and surface water is important in understanding the surface water's potential as a contaminant migration pathway or potential exposure area.

Sediments can potentially act as "contaminant traps" by two means, settling of particulate matter into the sediment, and adsorption of contaminants onto the sediment particle surfaces. If the sediments become contaminated, they can become potential sources that slowly release contamination into the surface water body, even after the original source is discontinued. Additionally, sediment contamination can adversely affect benthic stream biota.

Surface water and sediment samples were collected from three areas:

- FTA: One sediment sample was collected from the oil water separator.
- HHA: Five surface water and four sediment samples were collected.
- SL: Two surface water samples were collected.

2.2.2 Geology and Hydrogeology Investigations

The geologic investigation included two tasks: a surface soil hand augering program and an exploratory boring program. The purpose of both programs was to determine the physical and chemical characteristics of the soil. That information is necessary for:

- Determining which stratigraphic unit is present in the boring, which is then incorporated into the overall understanding of site and regional geology
- Estimating soil characteristics such as porosity and relative permeability, both of which are necessary to understand ground water movement
- Evaluating background soil chemistry for comparison to potentially affected soils
- Evaluating potential contaminant source chemistry

Three shallow soil samples were collected from each of the SIA and RIA areas for evaluation of background soil chemistry. Additionally, shallow soil samples were collected from two of the areas at FGGM to determine impacts of base activities:

- DSY: Six soil samples were collected to determine if the storage of transformers had impacted shallow soils.
- ODA: Eleven soil samples were collected from various depths at four locations to determine the effect of ordnance demolition on soil chemistry.

All nine soil borings drilled during the SIA were completed as monitoring wells. The newly installed wells were then used as part of the ground water investigation, which included ground water quality and hydraulic components. The purpose of the hydraulic investigation, which included water level measurements, was to identify the flow gradients and flow rates within the subsurface. The purpose of the ground water quality assessment was to (1) better define the contaminant plume margins, (2) define additional contaminant plumes, and (3) provide more adequate coverage in areas with insufficient data. A total of 18 wells were sampled during the SIA, including the following new wells:

- DSY: Two new wells were installed to help determine the extent of the VOC contamination.
- FTA: Three new wells were installed to evaluate potential ground water contamination in the area.
- HHA: One new well was installed to evaluate the nature of contamination in an area of high soil gas concentrations.

- ODA: Three new wells were installed to evaluate potential ground water contamination in the area.

In addition to installing new wells, all existing wells at the DSY, IL2, and HHA were sampled to determine ground water quality, and to determine if any changes had occurred since the previous sampling round.

Rainfall in the FGGM area was slightly below average for January and February of 1993, but significantly above average in March 1993. The average March rainfall is 3.38 inches, but 8.12 inches fell in March 1993 (National Weather Service, 1994). This unusually wet period delayed some field work and may have affected sample results. For example, ground water collected from shallow monitoring wells may have lower concentrations of contaminants than normal due to dilution. Also, overland flow of contaminants has a greater affect than normal. This may have occurred at the CFD where overland flow may have caused downgradient contamination through upwelling of ground water or by contact with surface debris.

2.2.3 Elevation Surveys

The objective of the location and elevation survey was to permanently and accurately provide location and elevation control for all new sampling points. The survey data are used for accurately plotting sample locations and for determining hydraulic flow directions and gradients, all of which are necessary for developing a site-specific chemical transport and fate model.

2.3 Investigative Procedures

The quality of the data collected for the FGGM investigation is a function of the overall design and planning of the sample collection program and the specific sample collection and handling procedures used. In addition to sample collection, our activities during the field investigation involved sample identification, sample handling, and field documentation. The standard procedures used to complete these tasks are detailed in the following documents:

- *Geotechnical Requirements for Drilling, Monitor Wells, Data Acquisition, and Reports* (USATHAMA, 1987)

- *Quality Control Program* (USATHAMA, 1990)

- *Quality Control Plan (QCP) for Fort Meade, Maryland* (Arthur D. Little, 1993c)

- *Work Plan for Fort Meade, Maryland* (Arthur D. Little, 1993d)

- Standard Operating Procedures (SOPs) (Arthur D. Little)

- *Health and Safety Plan for Fort Meade, Maryland* (Arthur D. Little, 1993b)
- Investigation-Derived Waste (Appendix O)

The sections below summarize the procedures, including any general deviations during the FGGM field investigation. Deviations specific to only one area are discussed in Sections 4.0 through 9.0.

2.3.1 Sample Identification, Handling, Preservation, and Shipping

2.3.1.1 Sample Identification. All samples collected during the FGGM field investigation were identified by their USAEC site identification (ID) and a unique nine-digit field ID tracking name. Existing site IDs were used when possible; new site IDs were chosen to match the existing site IDs. Site IDs identify the location at which a sample is collected.

The purpose of the field ID was to ensure that each sample had a unique name that could be used to track the sample as it progressed from the field to the laboratory and then to track the data as they were reported from the laboratory. A computerized system was used in the field that printed barcoded labels that could be scanned into the computer to produce chain-of-custody forms and to build a computerized database of samples sent to the laboratory. The field IDs were defined as follows:

Digit Number	Information	Examples
1	Location at FGGM	D=DSY, F=FTA, H=HHA, I=IL2, O=ODA, S=Soldiers Lake B=background, W=waste, Q=quality assurance
2	Sample round	Always set at 1 for this investigation
3	Sample type/source	M=monitoring well, T=stream, D=sediment, S=surface soil, B=boring, L=leachate, R=residential well, A=hand auger, X=waste/blanks
4-7	Site ID number	Based on site ID. MW-103 would have digits 0103.
8	Filtering status for aqueous samples; relative depth for soils	Y=unfiltered, Z=filtered, relative depths A-Z
9	Analysis	V=VOCs, S=SVOCs, M=metals, H=TPHC, P=PCB/pesticides, E=explosives, C=chloride, 4=sulfate, N=nitrate, T=TDS, O=TCLP organics/metals

For example, a ground water sample from the DSY, with a site ID of MW-43D, being analyzed for total metals, would have a field ID of D1M043DYM.

2.3.1.2 Sample Handling, Preservation, and Shipping. Sample handling includes the tasks involved from the time a sample is collected until it is shipped to the laboratory. The specific tasks depend upon the type of sample being collected and the intended analysis. Consistency in sample handling ensures that samples do not become contaminated or their integrity becomes compromised.

All samples were collected in either glass or polyethylene bottles, as specified on Table 2-2. Standard sampling and sample handling procedures are described in detail in Arthur D. Little's SOPs and Quality Control Plan (QCP). Procedures specific to USAEC or FGGM are summarized below:

- Samples collected for aqueous volatiles were first subjected to a preservative test as follows:
  - Three vials were triple pre-rinsed.
  - One vial was filled with the sample water, and a known volume (approximately 10 drops) of hydrochloric acid (HCl) was added.
  - The vial was closed and shaken and the final pH was tested.
  - If the pH was less than or equal to 1, the same volume of acid was added to the two remaining pre-rinsed vials and the sample was collected in the pre-preserved vials.

- Soil samples for volatile analysis were collected and then immediately transferred to vials. During drilling, the VOC sample was placed into the vial immediately after peeling the split-spoon sample and prior to descriptive logging. When composite hand auger samples were being collected, the VOC vials were filled from the first auger as soon as it was brought to the surface. The remaining soil sample containers were filled after the sample was composited in a stainless steel bowl using a stainless steel spoon.

- After a sample was collected, it was placed on ice and, at the end of the day, taken to the field trailer. Samples that required chemical preservation (Table 2-2) were then preserved and the final pH tested and documented. Samples for dissolved metals were filtered using a peristaltic pump with an in-line high-capacity 0.45 micron filter.

All samples were shipped on ice to DataChem Laboratories in Salt Lake City, Utah.

Chain-of-custody forms were placed in plastic bags and taped to the inside of the cooler lid. The coolers were taped and custody-sealed shut, and then shipped via Federal Express for overnight delivery.

2.3.2 Field Documentation

Field documentation is an essential part of the field investigation because it ensures that all of the necessary information is collected, any deviations from the standard operating procedures and the QCP are reported, and all field events can be recreated if necessary (SOP ADL-4014). Numerous forms were used in the field to document our work:

- A field notebook accompanied each sampling team throughout the day. All relevant site information not included on more specific forms was recorded in the notebooks.

- Calibration of field equipment was documented in the calibration notebook kept with the recharging equipment. Entries included date, initials of person calibrating, and any problems encountered.

- Drilling Logs, Well Installation Diagrams, and Daily Drilling Logs were used for all drilling activities.

- Well Development Logs were used for development of new monitoring wells.

- Well Sampling and Surface Water and Sediment Sampling Logs were used as appropriate.

- Daily Health and Safety reports were filled out daily by each team.

- Chain-of-Custody forms were completed for each sample shipment.

- Weekly field reports summarized the week's activities and were accompanied by the health and safety report, the necessary field forms and copies of the appropriate pages of the field notebooks. These reports were forwarded to USAEC when completed.

2.3.3 Surface Water and Sediment Sampling Procedures

Surface water sampling procedures depend upon the depth of the water to be sampled (SOP USA-1001). In shallow water (less than one foot deep), samples can be collected by immersing the sample bottles in the water taking care not to disturb the sediment.

In deeper waters, the samples can be collected by either wading into the water body or by use of a discrete bomb sampler. If the water body is deeper than twenty feet, a

vertical temperature profile of the water column should be measured to determine if a thermocline exists. In any case, field parameters should be measured prior to sample collection, and samples should be collected starting from downstream and moving upstream.

Procedures and deviations specific to FGGM were:

- All surface water samples were collected from shallow water less than three feet deep.

- Samples for VOCs were not collected by immersion. VOC samples were first collected in a prerinsed (non-VOC) sample bottle and then gently poured into the VOC vial. Although this may cause slight volatilation of contaminants, it was necessary because the vials were pre-preserved with HC1.

- Field screening readings (temperature, pH, conductivity, and turbidity) were collected following sample collection. This was done to ensure that the measurement could be collected in-situ without causing sediment problems in the shallow water.

- One of the samples from Soldiers Lake required ice augering, using a hand powered auger for access. Both of the Soldiers Lake surface water samples were collected as grab samples because the depth sampler would freeze during sample retrieval.

Sediment samples were collected from shallow stream bottoms either with a stainless steel trowel or a stainless steel hand auger. Samples for VOCs were collected immediately, and then the remaining sediment was placed in a stainless steel bowl, composited with a stainless steel spoon, and transferred into the appropriate sample containers. Sediment composite samples were collected by mixing equal volumes of soil from multiple locations. Generally, three volumes were collected using a hand auger in a triangle-shaped pattern. In locations where only small volumes could be obtained with the hand auger, up to six separate sample aliquots were collected for mixing. The sample aliquots were mixed with a stainless-steel spoon in a stainless-steel bowl until they were visually homogeneous to form a composite sample.

Sketch maps of the location were included in either the field notebook or in the sample collection logs. The depth of the water above the sediment was measured and noted.

2.3.4 Geologic Investigation Procedures

2.3.4.1 Shallow Soil Sampling. Two types of shallow soil samples were collected during the SIA: surface soils from 0 to 6 inches and shallow soils from 2 to 3 feet. Surface soils were collected to determine if stained areas had affected soil quality. The shallow samples were collected below the soil surface so that they were representative of the surficial deposits.

Three shallow soil samples were collected from each area at FGGM to establish background concentrations for metals and pesticides. Care was taken to collect background samples from undisturbed areas to obtain representative information about the area. Sampling locations were selected in areas with no visibly disturbed soil or with no indication of former human activity. However, only two samples were collected and analyzed from the FTA due to a sheen in the water at one sampling location.

At the FTA, only two background samples were collected and analyzed. A third representative background sample could not be analyzed because the water table in the area where the sample was collected was just below the surface (1 inch) and had a sheen. There were no other undisturbed areas nearby to serve as a substitute background sampling location and it was not clear whether the observed sheen was due to decaying organics or contaminant migration. Thus the sample was discarded.

The shallow soil samples were collected with a stainless steel hand auger. During the augering, changes in the soil with depth were noted and the sample was not collected until the natural soils were reached. Natural soils are soils that do not contain any fill or organic material such as cement, tree bark, plastic, etc. To ensure consistency, most samples were collected from 2 to 3 feet. Following collection, the soil type was described, and the sample was composited in a stainless steel bowl and transferred to appropriate containers.

Six surface soil (0 to 6 inches) samples were collected from the DSY transformer storage area. These samples were collected in a grid pattern, primarily from stained areas. The samples were collected in the same manner as the background soil samples.

2.3.4.2 Exploratory Boring Procedures. The soil boring program was conducted from January 19 to February 10, 1993. All drilling was conducted by the drilling subcontractor, ATEC Associates Inc. (ATEC), of Columbia, Maryland.

Unexploded ordnance (UXO) surveys were conducted in conjunction with the soil boring program by Environmental Hazards Specialists International, Inc. (EHSI) of Belvidere, North Carolina. UXO screening was conducted prior to and during any invasive procedure (i.e., drilling). The initial UXO survey was to a depth of 5 feet.

During the field investigations, downhole UXO monitoring was conducted at 4-foot intervals to a depth of 20 feet. To conduct the downhole UXO surveys, all drilling operations were discontinued, the augers were removed from the borehole and all metal objects including the drill rig were moved at least 15 feet from the boring. Downhole UXO monitoring was discontinued at depths of 20 feet; EHSI personnel were present at each location until well installation or well abandonment was completed.

The only drilling method used during the SIA soil boring activity was hollow stem auger (SOP USA-4001). Hollow stem auger (HSA) was used because it does not require the introduction of water during drilling, thus minimizing the impact upon local hydrogeology and changes to the hydraulic conductivity of the penetrated stratigraphic units. HSA involves advancing the augers into the subsurface using hydraulic pressures and rotation. Both the rotation of the augers during advancement and the screw-like orientation of the auger flights result in sediments being removed from the path of the auger and transported to the ground surface.

The final drilling depth for each borehole varied depending on the depth at which the ground water was encountered. All boring/well abandonments required prior approval by the USAEC geologist or Contracting Officer's Representative, regardless of reason. There were no borehole abandonments due to UXO. Specific deviations from the Geotechnical Requirements and the Work Plan are detailed for each area in Sections 4.0 through 8.0.

The breathing zone and boring headspace were continuously monitored during the soil boring program using either an Industrial Scientific MX 251 or AIMS 3000 combustible gas meter to monitor percent oxygen and lower explosivity limit and a Photovac photoionization detector (PID) to monitor total VOCs. Drill spoils were also screened with a geiger counter to screen for radioactivity.

Soil samples were collected with a 2-inch diameter, 24-inch long split spoon. The split spoon was advanced ahead of the auger in order to collect an undisturbed sample. Blow counts were recorded for each 6-inch interval and the spoon was immediately retrieved from the borehole. Upon removing and opening the split spoon, VOCs were measured with a PID. The split spoon samples were described and logged for later comparison and analysis. The Munsell color chart was used as a standard for color analysis. The Unified Soil Classification System (USCS) was used to classify unconsolidated sediments by grain size, particle type, and sorting. The ASTM Standard Penetration Test (SPT) was used to record relative compaction of overburden materials. The test measures split spoon penetration resistance by recording the number of blows required to drive the split spoon 6 inches, using a 140-pound hammer dropped 30 inches. Moisture content was estimated and total

VOC concentration was measured using a PID. All data were recorded on permanent field forms.

If chemical samples were collected, the split spoons were opened, material located along the outermost portion of the spoon (skin) was removed, and the soil samples were collected. VOC samples were collected first directly from the spoon to minimize the amount of volatilization of contaminants, then the remaining soils were composited in a stainless steel bowl and distributed among the appropriate bottles. Sampling depths for each analyte were noted in the field logs.

2.3.5 Ground Water Investigation Procedures

2.3.5.1 Monitoring Well Installation and Development. The USATHAMA (1987) Geotechnical Requirements for monitoring well installation specify a maximum of 3 feet of sand filter pack beneath the well screen, a minimum of 5 feet of filter pack above the well screen, a minimum bentonite seal of 5 feet, then grout to surface (SOP USA-4003 and USA-4008). These requirements assume ground water depths of 13 feet or more. The ground water in many locations at FGGM was shallow, thus the recommended requirements were not applicable. Approved deviations for specific sites are discussed in Sections 4.0 through 9.0.

All materials used for the monitoring well construction were approved by the USAEC geologist prior to initiating any field operations. The specifications for all of the materials used were maintained in the field trailer. The monitoring wells were constructed with a 4-inch, schedule 40 PVC riser and 10 feet of 0.010-inch slotted PVC screen. Well screens were packed with silica quartz sand and sealed with bentonite chips. A cement bentonite grout was tremied into the annular space in all wells above the seal. At the surface of each well, a 5-foot orange painted protective steel casing (2.5 foot stick-up) with padlocked steel caps was cemented into the ground with a square, 4-foot by 4-foot by 0.5-foot pad. Four orange-painted pickets were positioned 4 feet away from the casing to protect the monitoring well. All of the materials used to construct the monitoring wells (e.g., casing, riser, screen) were steam cleaned before installation as specified in the Geotechnical Requirements (USATHAMA, 1987).

Identically keyed brass locks were used to secure all wells. The PVC riser of each well was double notched or marked to provide a datum for elevation survey and water level measurements. Well names were painted with white paint on the steel casing.

All new monitoring wells were developed according to the USATHAMA Geotechnical Requirements (USATHAMA, 1987) and the Work Plan (Arthur D. Little, 1993d). Five times the standing water volume in the well (casing plus annulus) was removed for development. If any water was introduced during the drilling

operations, five times that volume was also removed. Field parameters temperature, pH, conductivity, and turbidity were measured prior to beginning development, once during the process, and at the end of development.

Deviations from the Work Plan (Arthur D. Little, 1993d) and Geotechnical Requirements (USATHAMA, 1987) are discussed under each site, however several basewide deviations were approved:

- The time period for development of new wells (48 hours to 7 days) was extended due to circumstances beyond control, such as access problems.

- Due to the large volume of purge water, the historical data, and the shallow depth to ground water, USAEC approved discharging all purge water directly onto the ground.

2.3.5.2 Monitoring Well Sampling. The monitoring wells were sampled beginning in February 1993 and ending in April 1993 with some additional sampling during January 1994. Collection of ground water samples included multiple tasks: water level measurements, purging, field parameter screening, and sample collection.

Prior to initiating sampling at each area, a complete set of depth-to-water and total depth measurements was collected. The measurements were collected before sampling to ensure that well purging did not affect the ground water flow direction or gradients.

Purging consists of removing a volume of water from the well equal to five times the standing water. Evacuation of five well volumes of standing water was used as set forth in the U.S. Army Toxic and Hazardous Materials Agency document *Geotechnical Requirements for Drilling, Monitor Wells, Data Acquisition, and Reports* (March, 1987). Water quality parameters including pH, conductivity, temperature, and turbidity were measured before and during purging, before sampling, and immediately after sampling for each location. The field parameters collected represent the range of least-sensitive indicators of aquifer re-equilibration to most-sensitive indicators of equilibrated conditions. The data collected during these investigations were used to confirm ground water flow patterns and characterize ground water quality.

Submersible pumps and bailers were used for a number of reasons for sampling at FGGM. Among the reasons were lack of acceptable alternative sampling methods, variable well conditions, cost, and data comparability to previous sampling events at FGGM. A low-flow purging technique was not considered for sampling events at FGGM for the SIA or RIA work because it was not a widely accepted industry standard at the time of work plan development. For example, the draft final EPA

Region I Groundwater Sampling Procedure for Low Flow Purge and Sampling was published August 10, 1994.

Submersible pumps and bailers were used to reduce variability and level of effort in sampling from well to well. Some wells at FGGM have a depth to water that is greater than 26 feet bgs, limiting the use of peristaltic pumps; some wells have high LEL readings, which may limit the use of electric pumps. Therefore, a bladder pump, with additional equipment, and an EPA-recommended seven-step decontamination procedure would have been necessary. Consistency in sampling procedure was maintained with the use of bailers and submersible pumps.

Ground water samples were collected previously at FGGM with bailers and submersible pumps. Comparability between data sets would have been questionable with a change in sampling technique.

Deviations from the Work Plan (Arthur D. Little, 1993d) and Geotechnical Requirements (USATHAMA, 1987) are discussed under each site, however, several basewide deviations were approved by USAEC:

- New wells could be sampled 7 days after development rather than the 14 days required in the Geotechnical Requirements (USATHAMA, 1987).
- If a well purged dry, the following procedure was followed:
  - Allow the well to recharge to its original level or for a minimum of 4 hours.
  - Purge dry a second time.
  - Allow the well to recharge a second time to either its original level or for a minimum of 4 hours.
  - Collect the samples.

  In some cases, wells that purged dry were allowed to recharge overnight and then repurged or sampled the following morning.

Appendices A through F include all of the field forms for the parcels investigated during the SIA: boring logs, monitoring well installation logs, well development logs, and monitoring well sampling forms.

Appendices G through N include copies of the analytical results from the individual sampling events during the SIA.

2.3.5.3 Elevation Survey Procedures. The location and elevation of each of the 14 newly installed wells were surveyed by Greenhorne and O'Mara of Greenbelt, Maryland. The survey point of each well was located between the double notches previously installed on the rim of the well riser. For horizontal control, the positions were surveyed using Universal Transverse Mercator. The vertical elevations were surveyed using the National Geodetic Vertical datum of 1929.

Figure 2-1: Summary of Activities

Site Name	Investigative Activities: Site Inspection	Remedial Investigation	Records Search	UXO Survey	Supply Well Survey	Soil Boring Samples	Surface Water and Sediment Samples	Surface soil Samples	Soil Borings	Monitoring Wells	Ground Water Samples	Sludge Samples
SI Addendum												
Inactive Landfill No. 2	●										6	
DPDO Salvage Yard	●			●						2	8	
Transformer Storage Area	●			●				6				
Helicopter Hangar Area	●						5/5			1	6	
Fire Training Area	●			●						3	3	1
Ordnance Demolition Area	●			●		12			4	3	3	
Background	●							30				
Soldiers Lake	●						2/0					
Drilling Water											2	
Totals						12	7/5	36	4	9	28	1

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Table 2-1: Rationale for the Scope of Work, SIA, Fort George G. Mea

Data Gap	Data Acquisition Activity	Rationale	Changes in SOW
Inactive Landfill No. 2			
1. Potential for fluctuations in ground water contamination is unknown for metals.	Sample all existing ground water monitoring wells. Perform chemical analyses: TAL metals (total and dissolved).	Previous site data indicate that metals are elevated in ground water. Additional samples will be used to evaluate their continuing presence and possible concentration trends.	No changes occurred.
2. Source chemistry unknown.	Collect one seep sample. Perform chemical analysis: TCL VOCs, TCL SVOCs, petroleum hydrocarbons, and TAL metals (total, dissolved).	Source chemistry can be characterized by seeps and then compared against ground water chemistry to evaluate contaminant migration.	No sample was collected because no seep was observed.
DPDO Salvage Yard			
3. Extent of ground water contamination not well delineated.	Install two additional wells; one downgradient from VOC contamination and one west of MW-42. Sample two new and five existing wells and analyzed for TCL VOCs, TCL SVOCs, and TAL metals (total, dissolved).	Wells will (1) help to delineate plume downgradient from known VOC contamination, and (2) determine if the contamination extends west of the known contamination.	No changes occurred.
4. Potential soil contamination from transformers.	Collect six surface soil samples from the transformer storage area and analyze for PCBs.	One soil sample, collected from this area during the SI, contained detectable PCBs. However, there is currently insufficient data to confirm if the area is a potential source.	No changes occurred.
Helicopter Hangar Area			
5. Potential contamination and background concentrations of surface water and sediments are unknown.	Collect five surface water and five sediment samples from locations upstream, adjacent to, and downstream of the site. Perform chemical analyses: TCL VOCs, TCL SVOCs, TAL metals, petroleum hydrocarbons.	The potential of stream contamination due to the site can be evaluated by the sediment and surface water chemistry.	No changes occurred.
6. Soil and ground water have not been characterized in areas of high soil gas or near the 10,000-gallon tank.	Install one monitoring well. Collect one soil sample for the boring and analyze for TCL VOCs, petroleum hydrocarbons. Collect ground water samples from new and existing wells and analyze for TCL VOCs, TCL SVOCs, petroleum hydrocarbons, TAL metals (total, dissolved).	Determine if the soil gas concentrations are indicative an additional areas of ground water contamination; evaluate potential contamination caused by the 10,000-gallon tank.	No changes occurred.
7. Ground water flow direction is unknown.	Have new and existing wells surveyed for location and elevation; collect water level measurements.	Information will be used to determine likely direction of ground water flow and contaminant migration.	No changes occurred.

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Table 2-1: Rationale for the Scope of Work, SIA, Fort George G. Meade

Data Gap	Data Acquisition Activity	Rationale	Changes in SOW
8. The potential exists for soil contamination at the oil/water separator but no data exists.	Collect a total of eight soil samples from four locations (two depths/hole). Analyze four samples for TCL VOCs, TCL SVOCs, petroleum hydrocarbons and TAL metals.	Determine if this area could be a source for potential ground water or outfall contamination.	No samples were collected because the base of the separator was too deep for hand augering; and also because frozen ground and site operations limited access.
Fire Training Area			
9. Confirm ground water contamination.	Install three wells and collect three ground water samples. Perform chemical analyses: TCL VOCs, TCL SVOCs, petroleum hydrocarbons, TAL metals (total, dissolved).	Odors observed during the SI (1992) indicate ground water contamination in this area.	No changes occurred.
10. There are currently no data regarding the suspected oil/water separator.	Collect a sludge sample from the oil/water separator. Perform chemical analysis: TCL VOCs including freon, TCL SVOCs, TAL metals and petroleum hydrocarbons.	The oil-water separator may be acting as a continuous source to ground water contamination.	No changes occurred.
Ordnance Demolition Area			
11. Extent of soil contamination is not well defined.	Collect three soil samples each from four soil borings for a total of twelve soil samples. Perform chemical analyses: Explosives, TAL metals.	One of the soil samples collected during the SI contained detectable RDX. Open demolition of explosives may have caused contamination by explosives.	No changes occurred.
12. No data are available on ground water quality.	Complete three of the borings as monitoring wells. Collect three ground water samples. Perform chemical analyses: TCL VOCs, TCL SVOCs, TAL metals (total, dissolved), explosives.	Ordnance demolition, plus ponding of rain water, may have caused ground water contamination. The three wells are necessary for determining ground water flow directions and contaminant plume extents.	No changes occurred.
13. Contaminated ground water may be discharging to the surface at a spring located in the southeast corner of the ODA.	Collect one surface water and one sediment sample from the spring. Perform chemical analysis: TCL VOCs, explosives.	The data will indicate if contaminated ground water is discharging upward.	No sample was collected because the seep was not observed.

Notes:

TAL = Target Analyte List
TCL = Target Compound List
SVOC = Semivolatile Organic Compound
PCB = Polychlorinated Biphenyl
VOC = Volatile Organic Compound
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine

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Table 2-2: Containers, Preservation, and Holding Times for Analytical Samples

Analysis	Sample Containers	Preservation	Holding Times
TCL Volatiles - water	Two 40-mL amber glass VOA vials, Teflon-lined cap	HCl to pH<2 Cool, 4°C	14 days
TCL Volatiles - soil/sediment	250-mL amber wide-mouth glass jar, Teflon-lined cap	Cool, 4°C	14 days
TCL Semivolatiles - water	1-L amber glass jar, Teflon-lined cap	Cool, 4°C	7 days to extraction; 40 days after extraction
TCL Semivolatiles - soil/sediment	250-mL amber wide-mouth glass jar, Teflon-lined cap	Cool, 4°C	7 days to extraction; 40 days after extraction
PCBs - water	1-L amber glass bottle, Teflon-lined cap	Cool, 4°C	7 days to extraction; 40 days after extraction
PCBs - soil/sediment	250-mL amber wide-mouth glass jar, Teflon-lined cap	Cool, 4°C	7 days to extraction; 40 days after extraction
Explosives - soil/sediment	250-mL amber wide-mouth glass jar, Teflon-lined cap	Cool, 4°C	7 days to extraction; 40 days after extraction*
Explosives - water	1-L amber glass bottle, Teflon-lined cap	Cool, 4°C	7 days to extraction; 40 days after extraction
TAL metals (ICP/GFAA) - water	1-L Polyethylene bottle, Teflon-lined cap	HNO_3 to pH<2	6 months
TAL metals (ICP/GFAA) -soil/sediment	250-mL amber wide-mouth glass jar, Teflon-lined cap	Cool, 4°C	6 months
Mercury - water	1-L polyethylene bottle, Teflon-lined cap	HNO_3 to pH<2	28 days

Table 2-2: Containers, Preservation, and Holding Times for Analytical Samples (continued)

Analysis	Sample Containers	Preservation	Holding Times
Mercury - soil/sediment	250-mL amber wide-mouth glass jar, Teflon-lined cap	Cool, 4°C	28 days
Chloride/Sulfate - water	250-mL polyethylene bottle	Cool, 4°C	28 days
Chloride/Sulfate - soil/sediment	250-mL amber wide-mouth glass jar	Cool, 4°C	28 days
Nitrate plus Nitrite - water	250-mL polyethylene bottle	Cool, 4°C H_2SO4 to pH<2	28 days
Nitrate plus Nitrite - soil/sediment	250-mL amber wide-mouth glass jar	Cool, 4°C	28 days
Total Dissolved Solids (TDS) - water	250-mL polyethylene bottle	Cool, 4°C	7 days
Total Petroleum Hydrocarbons (TPHC) - water	1-L amber glass bottle, Teflon-lined cap	Cool, 4°C H_2SO4 to pH<2	7 days to extraction; 40 days after extraction
Total Petroleum Hydrocarbons (TPHC) - soil/sediment	250-mL amber wide-mouth glass jar, Teflon-lined cap	Cool, 4°C	28 days
TCLP Analytes -water	Two 40-mL VOA vials and Two 1-L amber glass bottles, Teflon-lined cap	Cool, 4°C	**
TCLP Analytes -soil/sediment	Two 250-mL amber wide-mouth glass jars, Teflon-lined cap	Cool, 4°C	**

* The holding times for the Explosives analysis were specified by USAEC.

** The analytical holding times for the TCLP samples are provided below.

Table 2-2: Containers, Preservation, and Holding Times for Analytical Samples (continued)

TCLP Analysis	Max. Time: Sampling to TCLP Extraction	Max. Time: TCLP Extraction to Sample Prep.	Max. Time: Sample Prep. to Analysis	Max. Total Elapsed Time from Sample Collection
Volatiles	14 days	-	14 days	28 days
Semivolatiles/ Pesticides/PCBs	7 days	7 days	40 days	54 days
Metals	180 days	-	180 days	360 days
Mercury	28 days	-	28 days	56 days

Source: USAEC Quality Assurance Program (January 1990). TCLP information was taken from 40 CFR 261.

3.0 Basewide Investigation

3.1 Regulatory Standards and Guidelines

Federal and state regulatory standards were reviewed for relevance to FGGM. The purpose of this regulatory review is to provide the standards used for data comparison to determine if the detected concentrations were elevated. This is not intended to act as a full list of ARARs; they will be provided in the Feasibility Study. Federal standards, such as the PCB Spill Cleanup Policy, maximum contaminant levels, and Ambient Water Quality Criteria, are summarized for comparison against site data. Relevant State of Maryland regulations include Water Pollution and Water Supply. Each is summarized below.

3.1.1 Federal Regulations and Guidelines

PCB Spill Cleanup Policy. Under the Toxic Substances Control Act (TSCA), EPA has the authority to regulate PCBs use, production, and storage. An action limit of 50 ppm (µg/g) in soil has been established by EPA (40 CFR 761.125) as a baseline value to determine whether a cleanup action must be initiated. Measured concentrations of 50 µg/g or greater require EPA notification and initiation of a cleanup action. The state of Maryland has not established its own criteria for PCB management and follows the federal guidelines.

Maximum Contaminant Levels. MCLs are established in the Safe Drinking Water Act (40 CFR Parts 141, 142, and 143, 1992) and are added to, or updated, on an annual basis. Drinking water regulations from May 1993 are used throughout this document.

MCLs define the maximum permissible level of a contaminant in water that is delivered to any user of a public water supply. MCLs are given with their appropriate regulatory status: final, draft, listed for regulation, proposed, or tentative. As of May 1993, MCLs (of various status) have been defined for 67 organic compounds, 16 inorganics, and 6 radionuclides.

Maximum Contaminant Level Goals (MCLGs) are non-enforceable concentrations of drinking water contaminants that are protective of adverse human health effects and allow an adequate margin of safety.

Secondary MCLs (SMCLs) are non-enforceable and establish limits for contaminants in drinking water that may affect the aesthetic qualities and the public's acceptance of drinking water (e.g., taste and odor).

MCLs, MCLGs, and SMCLs are used for comparison with ground water concentrations to determine if elevated concentrations of the chemicals are present. This does not assume that all ground water is being used for drinking water but

provides a regulatory basis for determining which concentrations are considered "elevated." MCLs, MCLGs, and SMCLs are summarized on Table 3-1 for the compounds and chemicals detected during the field investigation. Additionally, regulatory standards are included on the tables of detected analytes included in each section.

Ambient Water Quality Criteria. EPA is required by the Clean Water Act [33 U.S.C. 1314(a)(1)] to publish and update Ambient Water Quality Criteria (AWQC) (EPA, 1992). AWQC reflect the current scientific knowledge on:

- The identifiable effects of pollutants in a body of water on health and welfare, including plankton, fish, shellfish, wildlife, plant life, shorelines, beaches, aesthetics, and recreation

- The concentration and dispersal of pollutants through biological, physical, and chemical processes

- The effects of pollutants on biological community diversity, productivity, and stability (EPA, May 1987)

AWQC are not federally enforceable rules but are provided as guidance on the environmental effects of pollutants that may impact water quality. However, AWQC are enforceable in Maryland because they have been promulgated by the state. AWQC for seven metals (cadmium, chromium, copper, lead, nickel, silver, and zinc) are dependent upon water hardness.

For FGGM, Freshwater AWQC are used for comparison for surface water bodies. Both maximum and continuous concentration criteria are used for comparison. The most current AWQC (EPA, 1992) are summarized on Table 3-1.

The National Oceanographic and Atmospheric Administration (NOAA) has Sediment Guidelines to evaluate when sediment concentrations affect surface water quality (Long and Morgan, 1991). The guidelines are protective of both freshwater and marine benthic organisms. NOAA guidelines that have been developed include values referred to as an effects range-low (ER-L) and an effects range-median (ERM-M). The ER-L is the concentration at which 10 percent of the bioassay test species exhibited an effect, while the ER-M is the concentration at which 50 percent of the test organisms exhibited an effect. These values have been developed for selected metals, SVOCs, and pesticides and are summarized on Table 3-1.

3.1.2 State of Maryland Regulations

Surface Water. The Code of Maryland Regulations (COMAR) 26.08.02 for Water Quality (July 1, 1991) (Maryland Department of Environment, 1991) defines water quality protection and designated classes for both surface water and ground water in the state of Maryland.

Surface water bodies are divided into four use classifications with three subclasses:

- Use I. Water Contact Recreation, and Protection of Aquatic Life. Subclass I-P includes Public Water Supply.
- Use II. Shellfish Harvesting Waters.
- Use III. Natural Trout Waters. Subclass III-P includes Public Water Supply.
- Use IV. Recreational Trout Waters. Subclass IV-P includes Public Water Supply.

According to the state of Maryland, the Little Patuxent River flowing through FGGM is classified as use I-P. Use I-P waters are subject to numerical criteria for bacteria, temperature, turbidity, and toxic substances.

Toxic substance criteria have been established for 11 metals and nine organic compounds. The state criteria are set at the same concentrations as the federal AWQC but are established for fewer analytes.

The Water Quality Regulations include an Anti-Degradation Policy for waters of the state. If water is of a higher quality than the water quality standards, that water quality should be maintained. Exceptions to the policy are if (1) there is a justifiable economic or social development, or (2) the changes will not diminish water use.

Ground Water. Ground water quality standards are also included in the Water Quality Regulations and include discharge permit requirements, aquifer type classifications, and water quality certifications for marsh creations projects, construction of bulkheads, and placement of riprap for shore protection.

The primary relevance of the ground water quality standards to FGGM is the aquifer types, which are defined as follows.

- Type I. Aquifers with a transmissivity greater than 1,000 gallons/day/foot, a permeability greater than 100 gallons/day/square foot, and total dissolved solids of less than 500 mg/L.

- Type II. Aquifers with a transmissivity greater than 10,000 gallons/day/foot, a permeability greater than 100 gallons/day/square foot, and total dissolved solids between 500 and 6,000 mg/L.

  or

  Aquifers with transmissivity between 1,000 and 10,000 gallons/day/foot, a permeability greater than 100 gallons/day/square foot, and total dissolved solids between 500 and 1,500 mg/L.

- Type III. All aquifers other than Type I and Type II.

All three aquifers investigated at FGGM -- the Upper Patapsco, the Lower Patapsco and the Patuxent -- are Type I aquifers.

Type I aquifers may not exceed primary or secondary standards for drinking water as outlined in COMAR 26.04.01.

Type II aquifers may not exceed primary or secondary standards for drinking water upon treatment by commercially available home water treatment or softening systems. Total dissolved solids (TDS) may exceed the requirements as outlined above for Type II aquifers.

To maintain a designation of Type III aquifer, the characteristics or constituents of the water must not meet Type I or Type II criteria. There are no specific requirements for Type III aquifers. However, during the project the aquifers should be closely monitored to identify any change in transmissivity, permeability and total dissolved solids that would change their aquifer classification.

Guidelines for discharge to ground water have been established. If activities on the project site will result in discharges to ground water then the guidelines outlined in COMAR 26.08.02.09-D will be applicable.

The guidelines require that:

- The Maryland Department of the Environment's "Guidelines for Land Treatment of Municipal Wastewaters" MDE-WMA-001-11/87 be followed for land disposal of municipal or similar wastes.

- Discharges to an aquifer (Type I, II, or III) do not result in an aquifer being polluted to a lower quality criteria or degradation of ground waters below criteria established above for Types I, II, and III, except for mixing zones that are permitted by the Department of the Environment.

- The Department of the Environment may require that dischargers or potential dischargers to ground water monitor ground or surface waters or both. The location and frequency would be designated by the Department of the Environment. Copies of the monitoring would be required to be submitted to the Department of the Environment.

Water Supply, Sewage Disposal and Solid Waste. Maryland COMAR Title 26.04.04 is the Well Construction Chapter of the Regulation of Water Supply, Sewage Disposal and Solid Waste. These regulations include well installation permits and well construction requirements in the state of Maryland.

Well permits were obtained by the drilling subcontractor (ATEC) from the Anne Arundel County Health Office. Applications for Permit to Drill Well and Well Completion Reports are included in Appendix G. The permit numbers, as required by Maryland, were permanently affixed to the well casings:

FGGM Area	USAEC Site ID Code	County Permit #
DSY	MW-200 MW-201	AA-88-9138 AA-88-9139
FTA	FTAMW-1 FTAMW-2 FTAMW-3	AA-88-9132 AA-88-9133 AA-88-9134
HHA	HHAMW-6	AA-88-9147
ODA	ODAMW-1 ODAMW-2 ODAMW-3	AA-88-9135 AA-88-9136 AA-88-9137

3.2 General Chemical Data Validation and Quality Assessment

3.2.1 Introduction

In order to ensure that the environmental samples collected in support of the FGGM SIA represent the actual conditions in the environment, the sampling program was designed to reduce analyte degradation, sampling variability, and cross-contamination.

Precautions were taken to prevent alteration of sample constituents, beginning with the appropriate use of USAEC and EPA approved sample containers. Such precautions were necessary to prevent changes that can occur in some samples due to biodegradation from microorganisms, the loss of volatile compounds with increasing temperature, or the loss of trace metals from solution by adsorption on sample

container walls. Samples were iced, refrigerated, and treated with chemical preservatives (HCl, HNO_3, and H_2SO_4) to decrease volatility of organic compounds, control biological and chemical changes, and maintain trace metals in solution.

To reduce sampling variability we used standardized procedures specified in the Quality Control Work Plan (Arthur D. Little, 1993c), Work Plan (Arthur D. Little, 1993d), and SOPs. These precautions helped us ensure that sampling was performed within the same guidelines each time. Sampling variability is measured by taking duplicate samples of the various types of environmental media. The precision of Arthur D. Little's sample collection and laboratory reproducibility is demonstrated when the analysis results for the duplicate samples are within acceptable limits.

Control samples were introduced into the train of environmental samples to function as monitors on the performance of the analytical method. The laboratory analyzed quality control samples to provide quantitative evidence that the USAEC methods were performing comparable to or improved over the level demonstrated during certification. As part of the USAEC QA Program compliance requirements, it is essential that controls were initiated during and maintained throughout the analysis of samples. Two types of laboratory control samples were included in all analytical lots: method blanks, to verify that the laboratory is not a source of samples contamination; and spikes, to verify performance at the level demonstrated during certification and to distinguish between the response obtained from the blank.

The quality of the sampling collection process is also evaluated by means of trip, field, and rinsate blanks. These sample blanks provide data monitoring the sampling process for cross-contamination. The blanks are transported along with the empty sample containers being taken by the sampling team into the field. When sampling is complete, the blanks are submitted along with the field samples for laboratory analyses.

3.2.2 Types of Quality Control Samples

Quality Control (QC) samples were collected in the field to assess overall precision, accuracy, and representativeness of the sampling an analytical efforts. The number of QC samples collected for this effort was based on the total amount of field samples as established in the Quality Control Plan (QCP). The different types of QC samples and the information provided by each are briefly described below.

Trip blanks were prepared in the laboratory by filling sample containers with de-ionized water and preserving with HCl. The containers were then sealed and transported to the sampling location along with the empty sample containers. These trip blanks were sent with sample shipments during this investigation, and analyzed for VOCs to assess potential contamination during transport.

Field blanks were used to obtain information about contaminants that may be introduced during sample collection, storage, and transport. These blanks are exposed to field conditions by preparing them at the sample collection site.

Rinsate blanks consisted of a composite from the de-ionized or distilled water used as a final rinse for cleaned sampling equipment (bailer, pump, auger, etc.) before it is reused for collecting samples. Results from analyzing rinsate blanks provide data to evaluate whether or not sampling equipment was free of contamination before being used to collect samples. The rinsate sample results for ground water are directly comparable to ground water sample results. The rinsate sample results for the soil samples are reported in micrograms per liter (µg/L) and are not directly comparable to the soil sample results, which are reported in micrograms per gram (µg/g).

Field duplicates provide intralaboratory precision information for the entire measurement system, including sample acquisition, homogeneity, handling, shipping, storage, preparation, and analysis. In addition, they can be used to estimate overall precision of the data collection activity. A total of six field duplicates were collected.

All field QC blank results were compared to thc sample results, and any compounds attributable to potential background contamination are discussed below. Field duplicate results that indicate samples are potentially not homogeneous result in the qualification of analytical results as "estimated."

3.2.3 Results of Field Quality Control Samples

None of the eight trip blanks contained reportable concentrations of contamination. Based on this information we can conclude that no volatile organic contamination associated with sample handling and transport occurred.

A total of eleven rinsate samples were collected for this study, at a rate of one per week, ensuring that rinsate blanks were collected for all equipment used for all matrices in this program (i.e., soils, surface and ground water samples). All of these rinsate blanks were collected for all organic and inorganic analyses. For volatile organics, 1,2-dichloropropane was detected above the certified reporting limit (CRL) in three of the blanks with concentrations of 5.0 µg/L, 6.0 µg/L and 7.0 µg/L. Trichloroethene was present in one of the blanks at 2 µg/L; and chloroform at 1 µg/L. Because chloroform was detected in field blanks, the deionized water provided by the laboratory might be the likely source of this contaminant. In addition, 1,3,5-trinitrobenzene is present in two of the blanks at concentrations of 1 µg/L and 2 µg/L.

For inorganics, eight metals were detected in the rinsate blanks. These were: calcium, detected in two of these blanks at concentrations of 221 µg/L and 519 µg/L; sodium, detected in four of the blanks at a range of 306 µg/L to 450 µg/L; iron, detected in

four of the blanks at a range of 147 µg/L to 7,780 µg/L; aluminum, present in two of the blanks at 287 µg/L and 794 µg/L; lead, detected in one blank at 8 µg/L; chromium, at 36 µg/L; barium, at 4 µg/L and 6 µg/L; and manganese, at 27 µg/L and 67 µg/L. The source of these contaminants was investigated: two likely sources are the de-ionization process of the water provided by the laboratory and the decontamination process in the field. USAEC procedures do not allow the use of solvents for decontamination. It is very difficult to achieve complete equipment decontamination without the use of solvents, as evidenced by the results of the rinsate blanks. In order to safeguard against potential cross contamination, the sampling staff implemented the practice of doing a second decontamination of the equipment before sampling the next location. This procedure minimizes the possibility of cross-contamination.

For semivolatile organics, one of the nine field blanks collected for this study had detectable, low concentrations of chloroform at 1 µg/L and two showed levels of 1,2-dichloropropane at 7 µg/L and 8 µg/L; 1,3,5-trinitrobenzene was detected in two blanks at 1 µg/L. These results are very close to the level of detection and well within a 10 percent margin of error, which suggest laboratory contamination. For inorganics, five metals were detected in field blanks. These were: sodium, detected in two of the blanks at 359 µg/L and 544 µg/L; barium in one blank at 5 µg/L; selenium in one blank at 4 µg/L; and lead in one blank at 26 µg/L. In this case, laboratory contamination can also be assumed, but, in addition, there is a possibility that these blanks were affected by airborne contaminants in the field.

All samples were analyzed within holding times according to USAEC requirements. Methylene chloride and acetone in the samples including the field duplicates are more than likely attributable to laboratory background contamination.

3.2.4 Data Validation

As we specified in the QCP (Arthur D. Little, 1993c), 10 percent of the data generated in this study were validated using the USAEC guidelines presented in the USATHAMA QAP, January 1990. The packages were chosen to cover a broad range of analyses and matrices. The Arthur D. Little Chemistry Group assessed these packages for completeness of the documentation provided, adherence to the analytical methods, adherence to the USAEC QC requirements, and acceptability of QC data. They also provided a technical review of the data and verification of the calculation procedures.

The validation process for the data generated to support the FGGM SIA and RIA demonstrated that the data met the data quality objectives (DQOs). No major deviations or problems were noted. Some observations made by our validators revealed a need for the laboratory to improve its documentation practices and to provide necessary raw data to reproduce its calculations. However, none of these

observations were significant enough to jeopardize the integrity of the data. In addition, these issues were presented to the laboratory and appropriate corrective actions were taken and were fully documented to avoid recurrence.

3.2.5 Data Quality Evaluation

Upon evaluation of the results of the field and laboratory QC samples, we have concluded that the objectives given in the QCP for the data quality indicators (precision, accuracy, representativeness, completeness, and comparability) provide evidence that the program's DQOs were achieved.

Precision - The analytical results of the field duplicates provided precision information for the assessment of the variability associated with field activities, which is a function of samples collection/handling as well as matrix homogeneity. All six field duplicates indicated acceptable precision for both water and soil samples, with the exception of various metals in some soils. This inhomogeneity is most likely due to variable intervals within the split spoon from which soils were collected.

Accuracy - This indicator was assessed as part of the USAEC control chart program. These charts, which are maintained for each control analyte by plotting the recovery of spiked QC samples, monitored the variations in the accuracy of routine analyses and detected trends in the observed variations. Based on our data validation results and the acceptance letters of the USAEC Chemistry Branch, the data generated to support this study met the QCP accuracy objectives.

Representativeness - All sampling locations for the FGGM investigations covered in this project were selected using a targeted sampling design. Representativeness reflects this design and is maximized by proper selection of sampling locations and collection of a sufficient number of samples. The Work Plan provides a very exhaustive description of samples were selected.

Completeness - Even though there was a minimal loss of data due to laboratory instrument failure, the goal of 90 percent completeness was met and exceeded; 99 percent completeness was achieved.

Comparability - In order to increase the level of confidence with which this data set can be compared to another, we ensured that our field team and laboratory were using the appropriate sampling methods, chain of custody procedures, USAEC and EPA methods, adherence to QA/QC program, units of reporting, and correction of measured values to standard conditions.

3.3 Background Soil and Ground Water Chemistry

3.3.1 Background Soil Chemistry

Background soil samples were collected from 31 locations (at least three per site in the SIA and RIA) at FGGM. We attempted to select sample locations that showed no direct impact from base activities. Our selection was based on known activities, established areas of concern, and visual observations. For example, most of the samples were collected from wooded areas indicating that no buildings or large-scale activities had been conducted recently. The collection of soil samples offpost was outside of our scope of work; however, we anticipate that the selection of off-post locations may encounter similar problems as on-post, i.e., finding an area without anthropogenic impact.

Due to the widespread human impact at FGGM, these samples may be more representative of background concentrations than a pure geologic background. This is particularly true for the RIA and SIA because in those studies we have attempted to evaluate if, and how much specific sites have contributed to environmental contamination. Background conditions for the specific sites are likely to incorporate areas in which other activities have occurred. We have attempted to exclude areas of documented contamination, however, onsite areas that may have had some impact are more likely to reflect the background conditions for specific SIA and RIA areas.

Thirty samples were analyzed for metals and pesticides; the remaining sample was not analyzed due to a possible sheen on the ground water observed by field personnel. Ground water at this location was encountered just below the surface of the soil. The sample was discarded because it was unclear if the sheen indicted that the soil was contaminated, in which case the concentrations would not be representative of background conditions. Figures 3-1, 3-2 and 3-3 are maps identifying the locations for the background samples.

Eighteen of the metals analyzed for were detected (Table 3-2) in the soil samples. Eight metals were present in all 30 samples: aluminum, barium, chromium, iron, lead, magnesium, vanadium, and zinc. Other metals detected at a frequency of 75 percent or more were calcium, manganese, and potassium.

The samples were collected from across FGGM, therefore they likely represent more than one geologic formation. Based on the previous investigations, we believe that the following samples were collected from soils overlying the Lower Patapsco Formation:

- DSY (BKG-16, BKG-17, BKG-18, BKG-22, BKG-23)
- FTA (BKG-13, BKG-14)
- HHA (BKG-7, BKG-8, BKG-9)

- IL2 (BKG-10, BKG-11, BKG-12)
- ODA (BKG-1, BKG-2, BKG-27, BKG-28)

There is some question regarding the samples from CFD, SL, and ASL.

- The CFD samples (BKG-4, BKG-5, BKG-6, BKG-31) are thought to be from soil overlying the Middle Confining Layer.

- Given that the Upper Patapsco Formation pinches out at the ASL, it is likely that the ASL samples are from soil overlying the Lower Patapsco. At the ASL, background sample BKG-30 may represent the Upper Patapsco, but the other background samples are generally west of where the Upper Patapsco pinches out and are more likely to be from the Lower Patapsco. However, because the exact extent of the Upper Patapsco formation is not known, we cannot be certain of the source of these samples. Additional Upper Patapsco samples could not be collected because the area at FGGM where the Upper Patapsco surfaces is largely covered by the active landfill.

- Based on the location of Soldiers' Lake, the SL background samples are probably from the Lower Patapsco, but no drilling has been done at SL to confirm the geology.

The maximum, mean, and detection frequency are summarized for each geologic formation on Table 3-3. In summary, there were 25 samples collected from the Lower Patapsco, 4 from the Middle Confining Layer, and 1 from the Upper Patapsco. The maximum concentrations were generally in the Lower Patapsco with the exception of chromium, iron, potassium, and vanadium that were detected at the highest concentrations in the Middle Confining Layer. Given the distribution of samples between the aquifers, it is difficult to determine separate background concentrations for each. However, the distribution does generally reflect the distribution of the samples collected for site evaluation.

Due to background concentrations and natural variability, it is often difficult to establish which metals are representative of background chemistry. For example, metals such as iron and magnesium are present in all samples and can be naturally present at very high concentrations. Assuming that naturally occurring metals are present at concentrations that represent a statistically lognormal distribution, it is possible to identify populations that fall outside of the distribution, indicating that those concentrations are elevated. This assessment can be conducted through log-frequency analysis. For the analysis, the concentrations of all detected data are plotted logarithmically on the y-axis versus the frequency distribution of the data on the x-axis. The frequency of number was calculated by first ordering and numbering

all results from lowest to highest. The number of each data point was then divided by the total number of data points plus one and the result was multiplied by 100.

$$\mathbf{F = (D/ (N+1))\ 100}$$

where:	F	=	frequency number
	D	=	data number (the lowest result is assigned a 1, the second lowest a 2, etc.)
	N	=	total number of data points

Non-detected results are included in the data number count but are not graphed.

The use of the frequency distribution diagrams is to evaluate if the metals generally fall within a single population or if there are notable outliers. We have not attempted to select a single background concentration, rather we used plots to graphically evaluate if the data fell within one population. We would like to note that although this technique was used only qualitatively for this assessment, it is an approach used by EPA Region I staff (including risk assessors). Arthur D. Little has used the frequency distribution technique in conjunction with other methods while working for EPA Region I. This technique has been used successfully to identify outliers from the general population. (Shevenell, Moore and Dreier, 1994, GWMR). This is a qualitative evaluation and has only been used as such. Frequency distribution graphs are included for three metals: chromium, lead, and nickel. These metals were selected due to the possibility that they have been identified at potentially elevated levels in ground water.

- Chromium was detected in all 30 soil samples. All of the concentrations fall on a straight line, indicating a natural distribution (Figure 3-3).

- Lead was detected in all 30 samples. Only two samples, both from the IL2, fall outside of the population (Figure 3-3).

- Nickel was detected in 13 of the 20 samples. All but one sample, BKG-12 from the IL2, fall on a straight line (Figure 3-4).

As indicated by the plots for the three metals, most of the metal concentrations fall within single populations. A total of three samples fell outside of the lognormal distribution for the three metals graphed. All of those samples were collected from either the IL2 or the CFD.

The elevated concentrations may be due to either natural variability or human impact. Although an effort was made to collect samples from unimpacted areas, impact was often difficult to identify or confirm. The IL2 and the CFD samples may have been

from areas in which some dumping has occurred; unnatural land forms (i.e., possible debris piles) were identified in both areas. An additional discussion of the background metals is included in Section 8.0 along with the metals data for the ODA soil samples.

One or more pesticides were detected in 10 of the 30 background soil samples (Table 3-2). A total of four pesticides were detected. With the exception of greater than 0.1 µg/L of heptachlor-epoxide in BKG-8, the highest concentrations of pesticides are:

- 0.016 µg/L p,p-DDE in BKG-8
- 0.016 µg/L p,p-DDT in BKG-8
- 0.016 µg/L heptachlor epoxide in BKG-13

In general, low concentrations of pesticides are present in some samples. This corresponds with the ground water data from the RI and SI. Although pesticides were common in ground water, no compound with an MCL exceeded its standard. Therefore, although pesticides are ubiquitous in all media at FGGM, they are present at very low concentrations.

It should be noted that, with the exception of the ODA, the background soil data collected during the SIA and RIA are not being used for direct comparison with site data. At the ODA, the background metal data were combined with the site data to plot frequency distribution diagrams. These diagrams indicate that not only do some of the ODA metal concentrations fall outside of the population, but also some of the background soil samples do. This is in agreement with the earlier comments that some of the selected background locations may be impacted by anthropogenic activities and, therefore, may represent elevated metal concentrations. However, the conclusions made for the ODA are based on the spacial and vertical distribution of metals in ODA samples and not on the comparison of the ODA samples with the background data. Therefore, the background data have not been used to determine whether the metals are present in elevated concentrations, or if future determinations are needed.

In summary, we have concluded the following regarding the background soil sample collection and data:

- Although we made an attempt to collect samples from undisturbed locations, it is likely that many of the samples were collected in areas of at least minimal human impact. However, the samples are still representative of background for individual sites.

- There may be some change in soil chemistry between the geologic formations, but, given the discrepancy in total number of samples collected from each formation, the data are difficult to compare.

- The background concentrations are not directly compared against any site data and are not used to rule out other metal concentrations as being below background.

- The risk assessments include all chemical data regardless of how the concentrations compare against background concentrations.

3.3.2 Background Metal Concentrations in Ground Water

Background metal concentrations in FGGM ground water generally were determined on a site-specific basis. When possible, an upgradient well was used to represent the background concentration. However, this procedure was complicated in areas in which there was no clear upgradient well; this may be due to the presence of upgradient sources, radial ground water flow, or lack of a correctly placed well. The following specific problems were encountered in attempts to establish background metal concentrations:

- DSY: Chlorinated volatile organic compounds (VOCs) were detected in the most upgradient well in this area, indicating either an additional source exists or that the DSY source is larger than estimated. Therefore, background metal concentrations could not be determined for ground water.

- FTA: No background concentrations were established at this area because none of the wells was located directly upgradient of the source area.

- HHA: The most upgradient well at the HHA contains arsenic, cadmium, and lead above maximum contaminant levels (MCLs), therefore, the metal concentrations were considered to be above background.

- IL2: There is no upgradient well for this area. The most upgradient wells are located cross-gradient of the source area. However, there is the potential for radial flow in this area, so an upgradient location may not exist for background purposes.

- ODA: The most upgradient well was found to contain chlorinated VOCs, therefore, no background locations exist for ground water in this area.

- ASL: Various methods were used to determine background metal concentrations at the ASL. Table 4-12 in the RIA contains a comparison of background metal data for the ASL. The data includes three separate, published sources specific to the

Patapsco Aquifer in Anne Arundel County. We have also included data from upgradient wells for both aquifers over two different sampling events. On Table 4-13 in the RIA, the chemical data from the Upper Patapsco Aquifer are compared against the published and upgradient background concentrations. On Table 4-16 the chemical data from the Lower Patapsco Aquifer are compared against the published and upgradient background concentrations.

- CFD: A chlorinated VOC was detected in the upgradient well along with lead and chromium above MCLs, therefore, no background concentrations were established for this area.

Due to the problems in determining background metal concentrations at the SIA and RIA sites, we used MCLs to determine when metal concentrations were elevated. Additionally, at the CFD and the ASL, where risk assessments were conducted, all metals were included in the assessment. No metals were excluded from the risk assessment because they were below background. Therefore, the risk assessment conservatively includes both background metals and site-contributed metals.

According to EPA Region III guidance, *Draft Guidance on Selecting Analytical Metal Results from Monitoring Well Samples for the Quantitative Assessment of Risk*[1], dissolved metal concentrations could be used in place of total metal concentrations for the risk assessment. This is based on the nature of the aquifers (primarily medium sand). However, the human health risk falls above the EPA's acceptable risk criteria (incremental cancer risk of 10^{-6} for carcinogenic risk; hazard index of 1.0 for non-carcinogenic risk) regardless of whether the dissolved or total metal concentrations were used.

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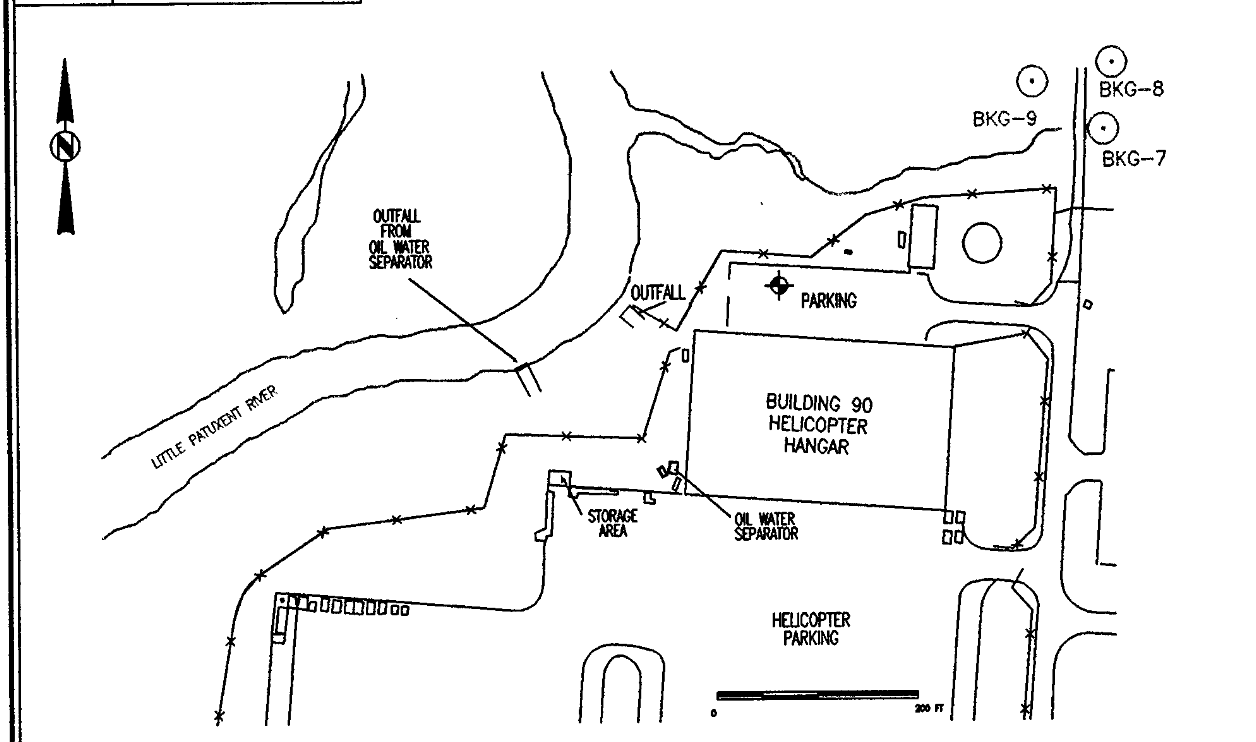
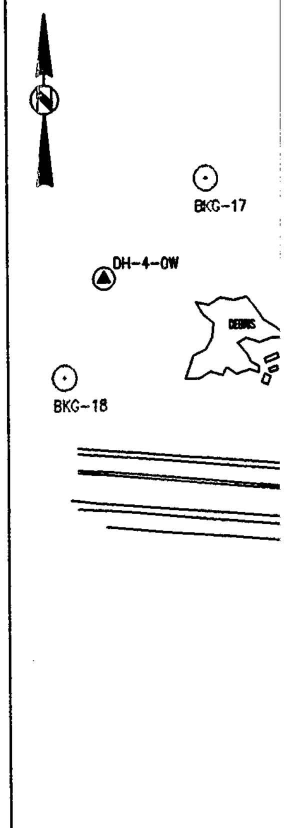
[1] EPA Region III Guidance. August 10, 1992.

REV. #	REVISION DATE
0	1/14/94
1	3/11/94

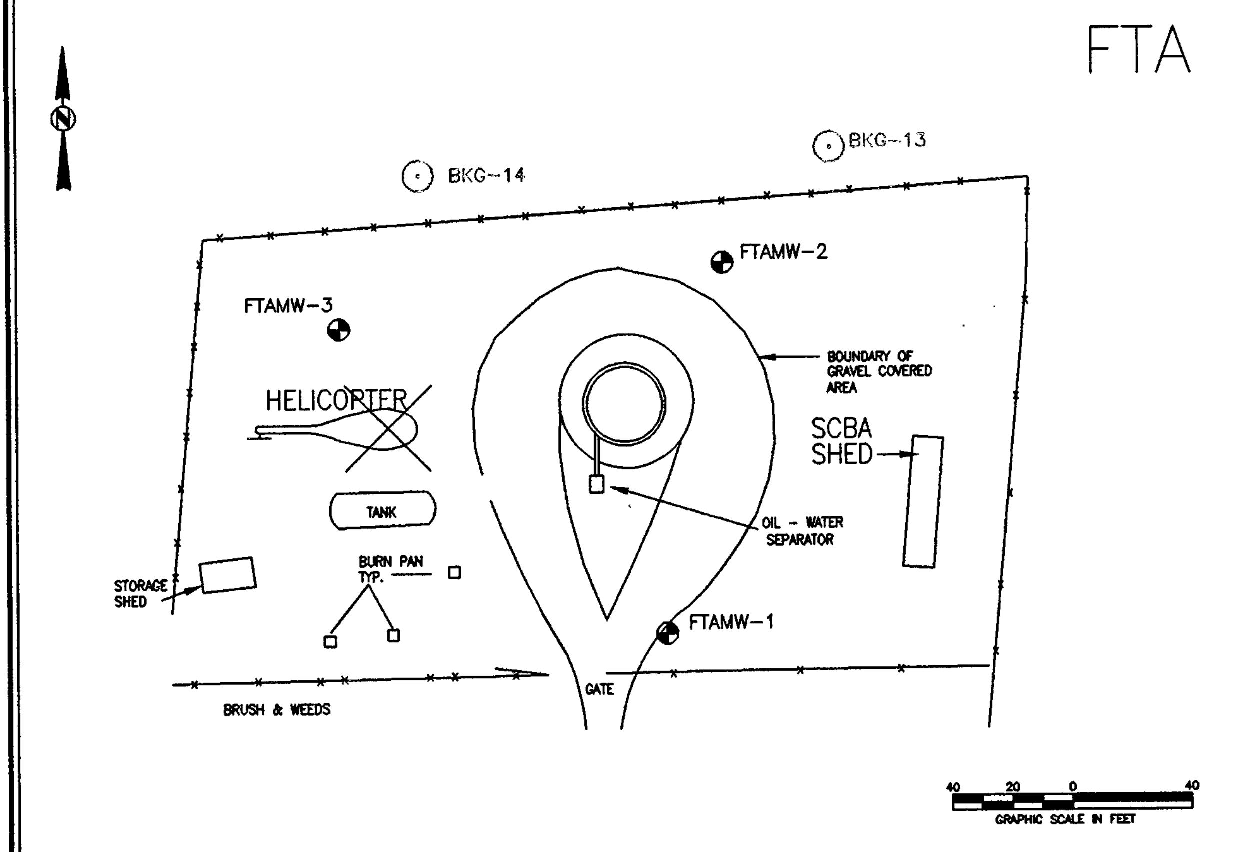
(1)

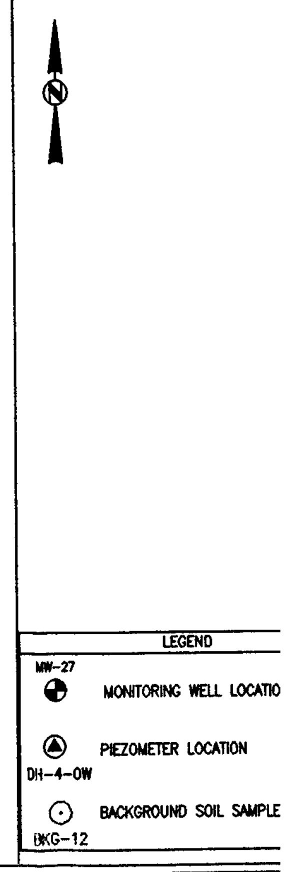
HHA





FTA





PREPARED FOR:	USAEC		DRAWN BY: (INITIALS)
DATE: JAN. 1994	SCALE: AS SHOWN	DWG. NO. 67069043	APPROVED BY: (INITIALS)

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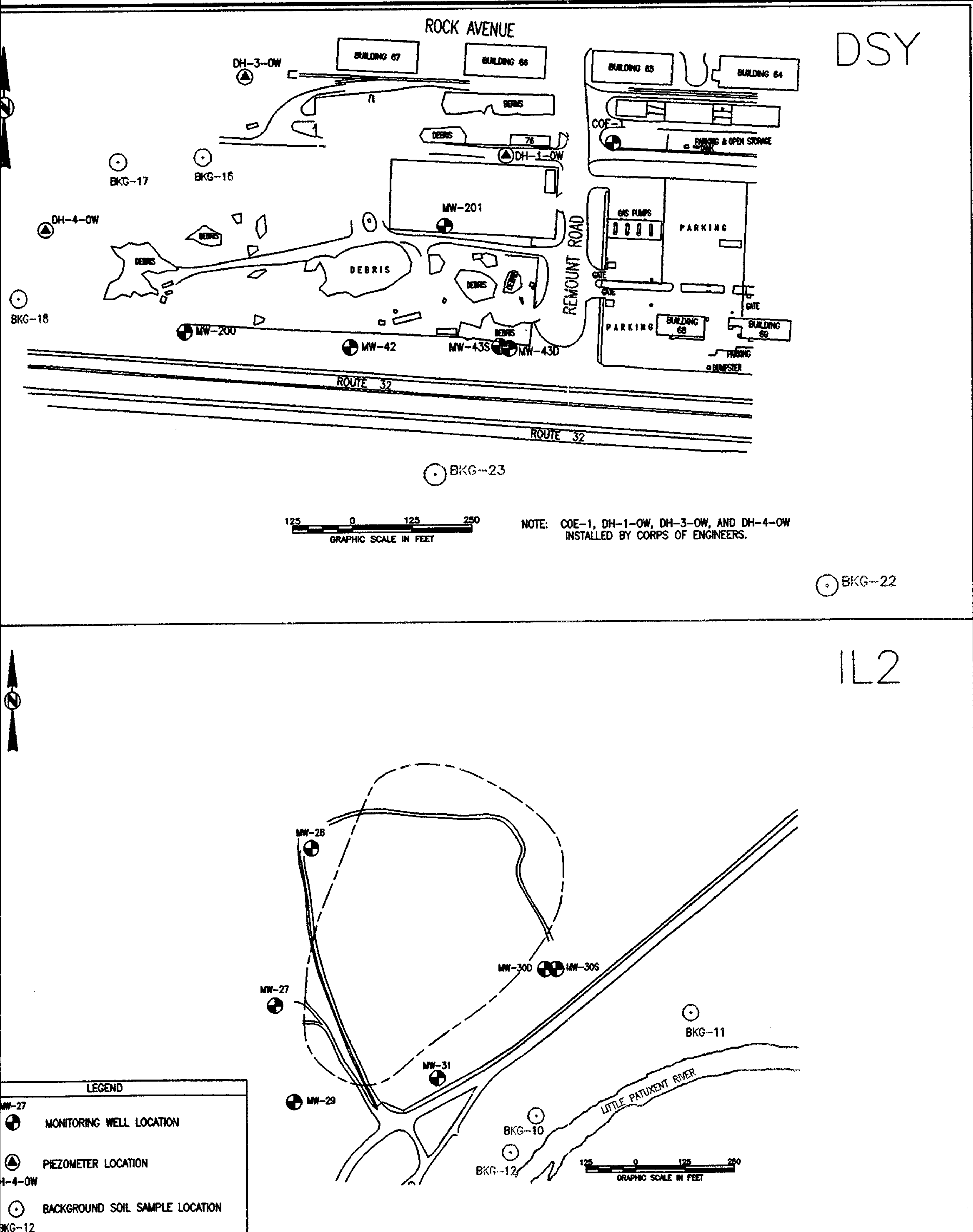

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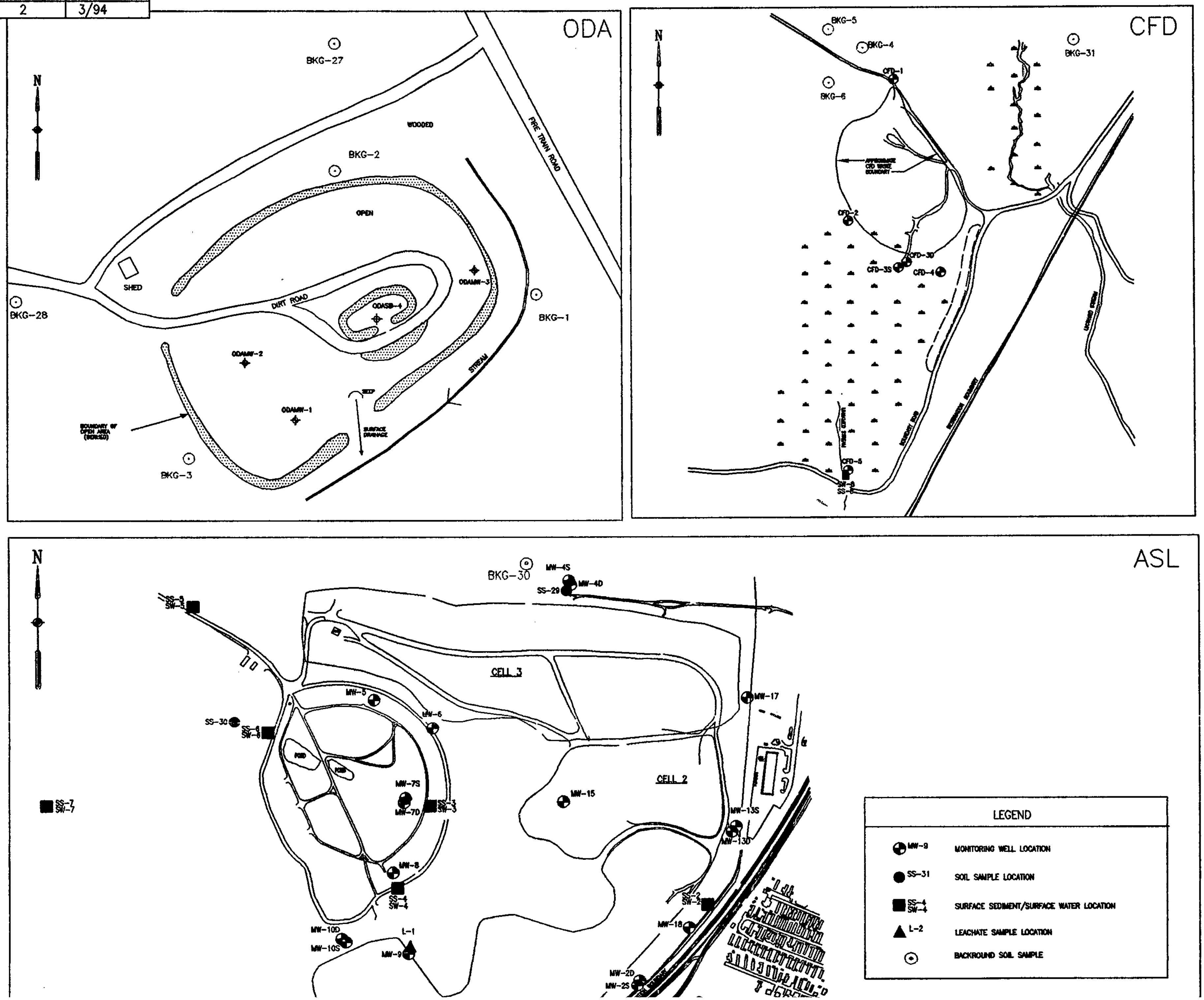
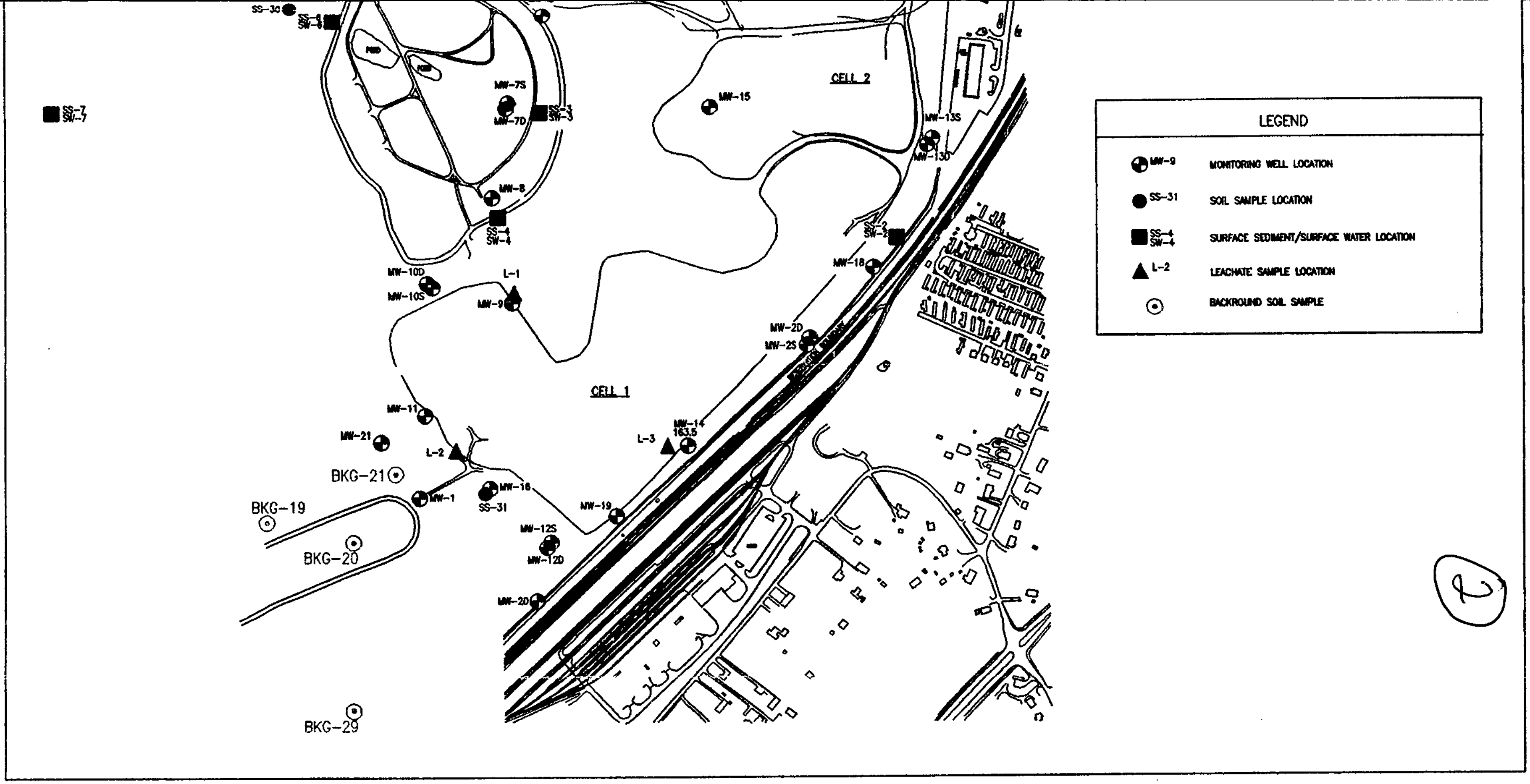
Arthur D Little

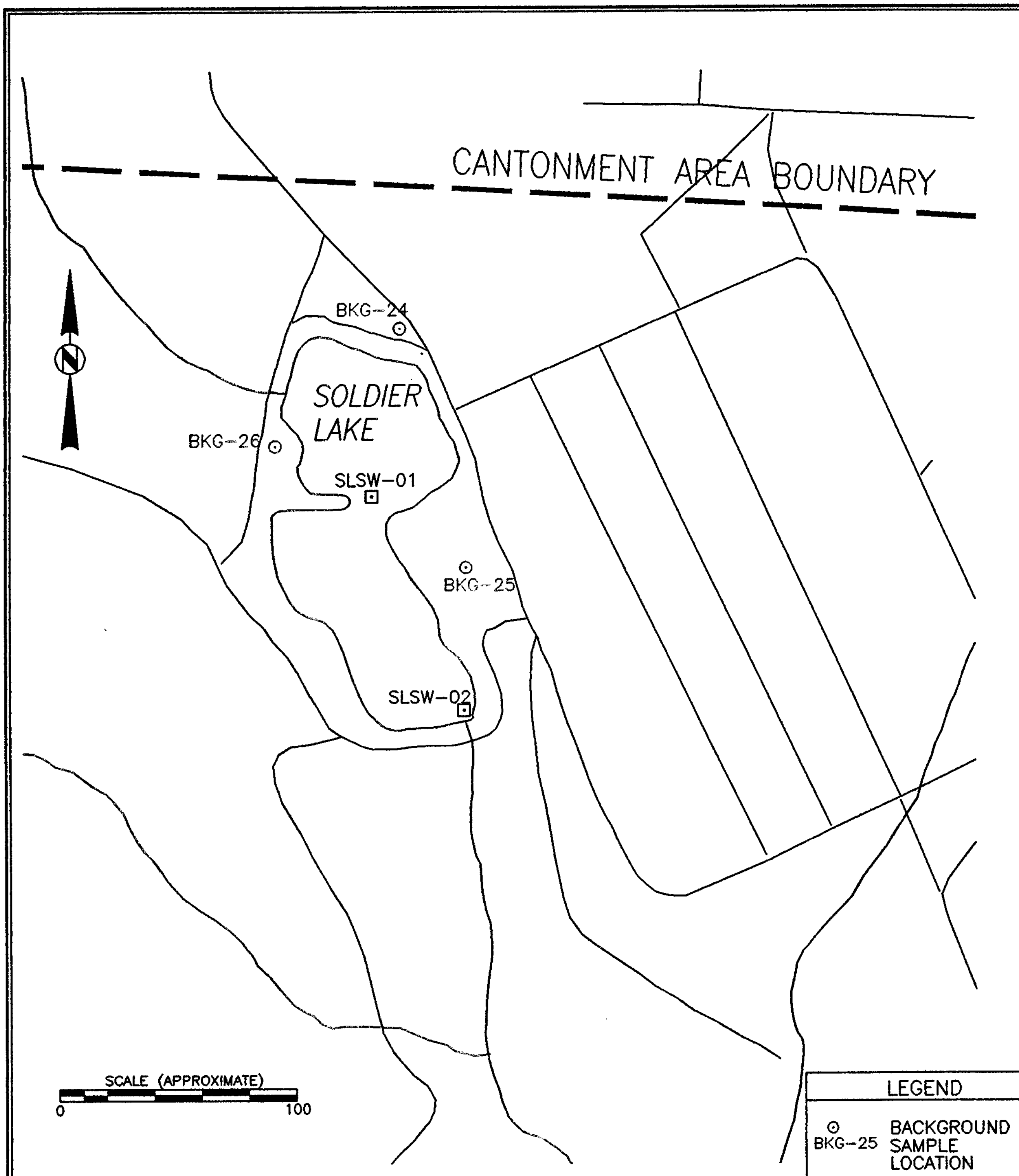
TITLE: FIGURE 3-1: APPROXIMATE LOCATIONS OF BACKGROUND SOIL SAMPLES

REV #	DATE
2	3/94





PREPARED FOR: USAEC		DRAWN BY:	TITLE: FIGURE 3–2: APPROXIMATE LOCATIONS OF BACKGROUND SOIL SAMPLES
DATE: JAN. 1994	DWG. NO.: 67069–040	APPROVED BY:	
SOURCE: USAEC, 1992		Arthur D Little	



PREPARED FOR: USAEC

DATE: 3/94

DWG. NO.: 67069049

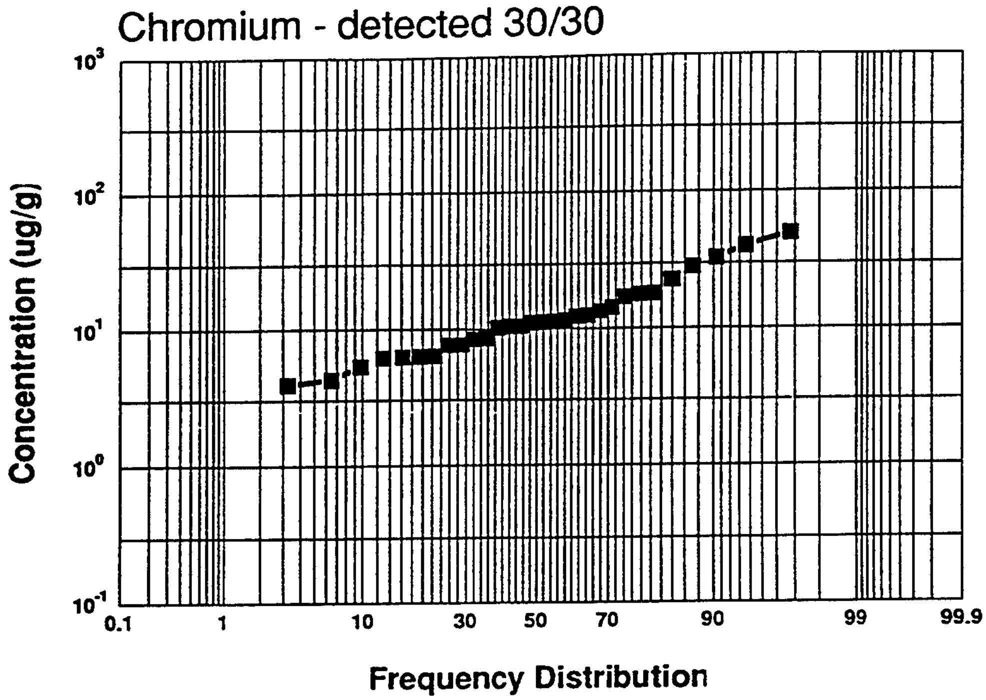
SCALE: AS SHOWN

SOURCE: USAEC 1992

Arthur D Little

TITLE: FIGURE 3-3: APPROXIMATE LOCATIONS OF BACKGROUND SOIL SAMPLES

Figure 3-4: Frequency Distribution of Chromium and Lead in Background Soil Samples



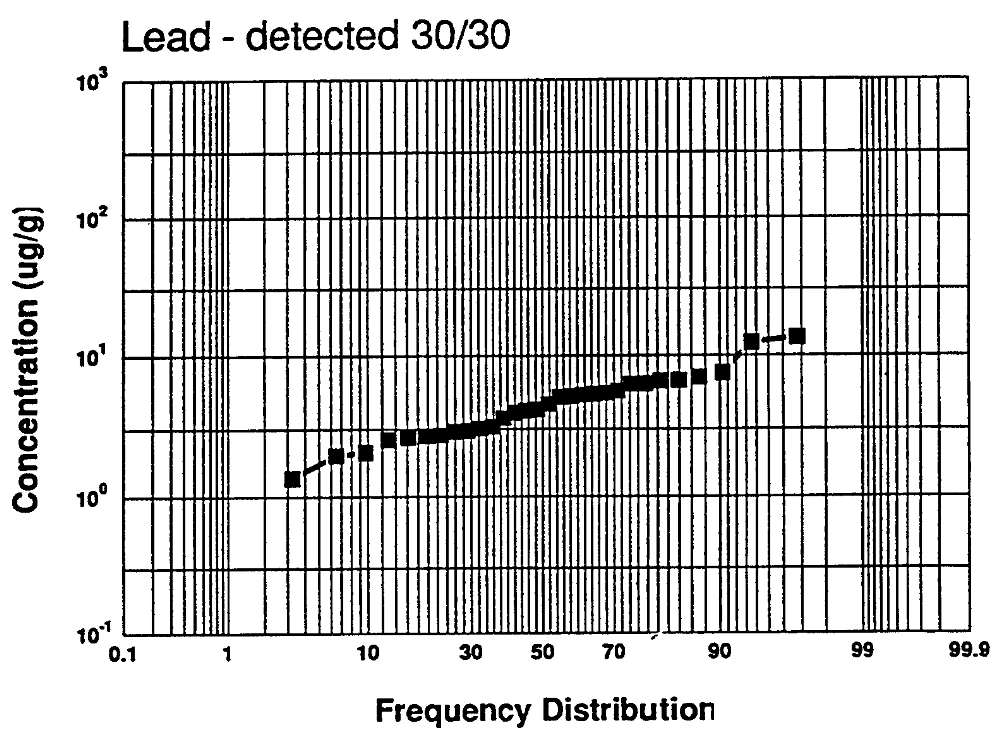


Figure 3-5: Frequency Distribution of Nickel in Background Soil Samples

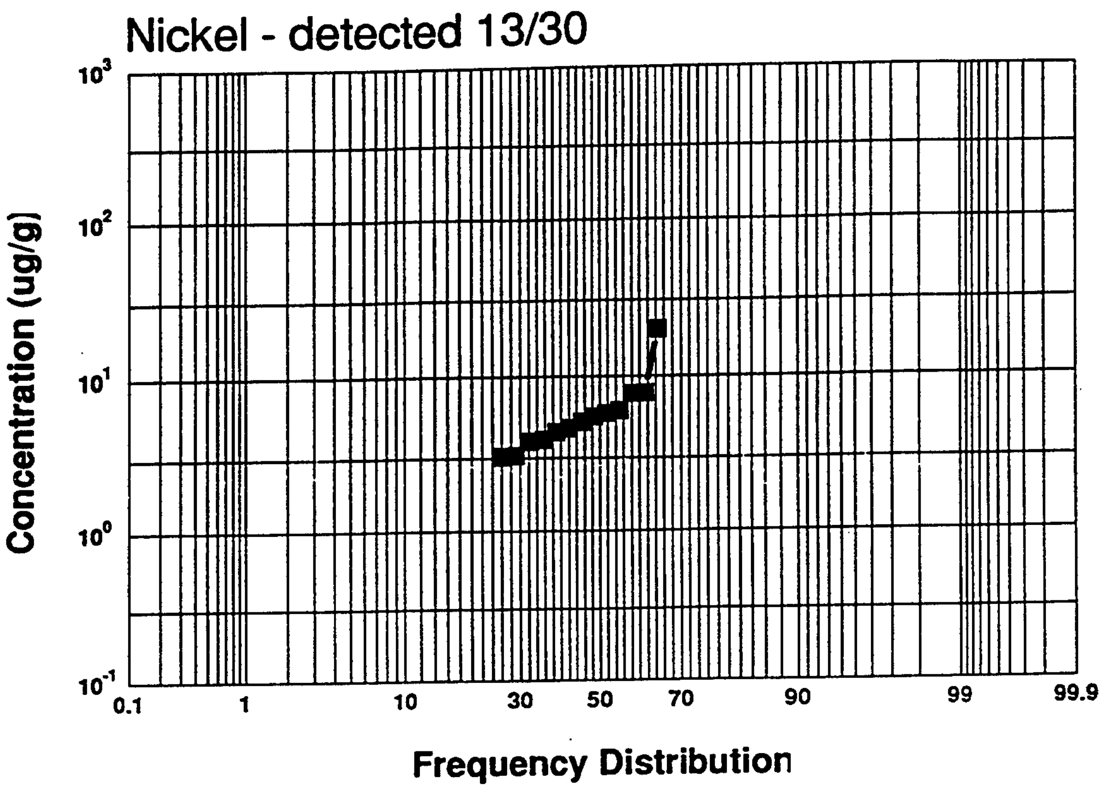


Table 3-1: Federal Standards for the FGGM RIA and SIA (Page 1 of 2)

Analyte	Federal Drinking Water Standards MCL ug/L	SMCL/MCLG ug/L		Ambient Water Quality Criteria Maximum ug/L	Continuous ug/L	Health Advisory ug/L	NOAA ER-L ug/kg	ER-M ug/kg
VOLATILE ORGANIC COMPOUNDS								
Aromatics								
carbon tetrachloride	5	0	G	—	—	—	—	—
toluene	1,000	1,000	G	—	—	—	—	—
1,4-dichlorobenzene	75	75	G	—	—	—	—	—
benzene	5	0	G	—	—	—	—	—
chlorobenzene	—	—		—	—	—	—	—
dichlorobenzene	75	75	G (1)	—	—	—	—	—
ethylbenzene	700	700	G	—	—	—	—	—
xylenes	10,000	10,000	G	—	—	—	—	—
Halogenated VOCs								
chloroethane	—	—		—	—	—	—	—
chloroform	100	0	G (2)	—	—	—	—	—
chloroethene	—	—		—	—	—	—	—
1,1-dichloroethane	—	—	G	—	—	—	—	—
1,2-dichloroethenes	—	70	G (3)	—	—	—	—	—
1,2-dichloropropane	5	0	G	—	—	—	—	—
trichlorofluoromethane	—	—		—	—	—	—	—
tetrachloroethene	5	0	G	—	—	—	—	—
trichloroethene	5	0	G	—	—	—	—	—
1,1,2,2-tetrachloroethane	—	—		—	—	—	—	—
Other								
4-methyl-2-pentanone	—	—		—	—	—	—	—
trichlorofloromethane	—	—		—	—	—	—	—
SEMIVOLATILE ORGANIC COMPOUNDS								
bis(2-chloroethyl)ether	—	—		—	—	—	—	—
bromocil	—	—		—	—	—	—	—
4-chloro-3-creosol	—	—		—	—	—	—	—
1,4-dichlorobenzene	75	75	G	—	—	—	—	—
diethyl phthatlate	—	—		—	—	—	—	—
2,4-dimethylphenol	—	—		—	—	—	—	—
2-methylphenol	—	—		—	—	—	—	—
4-methylphenol	—	—		—	—	—	—	—
naphalene	—	—		—	—	—	—	—
EXPLOSIVES								
RDX	—	—		—	—	2	—	—
HMX	—	—		—	—	400	—	—

Table 3-1: Federal Standards for the FGGM RIA and SIA (Page 2 of 2)

Analyte	Federal Drinking Water Standards MCL ug/L	SMCL/MCLG ug/L		Ambient Water Quality Criteria Maximum ug/L	Continuous ug/L	Health Advisory ug/L	NOAA ER-L ug/kg	ER-M ug/kg
CONVENTIONAL PARAMETERS								
chloride	—	250,000		—	—	—	—	—
sulfate	—	250,000		—	—	—	—	—
nitrate	10,000	10,000	S	—	—	—	—	—
total dissolved solids	—	—		—	—	—	—	—
METALS								
silver	—	100	S	4	—	—	1,000	2,200
aluminum	—	50-200	S	—	—	—	—	—
arsenic	50	—		360	190	—	33,000	85,000
boron	—	—		—	—	—	—	—
barium	2,000	—		—	—	—	—	—
beryllium	4	—		—	—	—	—	—
calcium	—	—		—	—	—	—	—
cadmium	5	—		4	1	—	5,000	9,000
cobalt	—	—		—	—	—	—	—
chromium	100	—		16	11	—	80,000	145,000
copper	1,300	1,000/1,300	S/G (4)	18	12	—	70,000	390,000
iron	—	300	S	—	—	—	—	—
potassium	—	—		—	—	—	—	—
magnesium	—	—		—	—	—	—	—
manganese	—	200	S	—	—	—	—	—
mercury	2	—		2	0	—	150	1,300
sodium	—	—		—	—	—	—	—
nickel	100	—		1,400	160	—	30,000	50,000
lead	15	—	(5)	82	3	—	35,000	110,000
antimony	6	—		—	—	—	2,000	25,000
selenium	50	—		20	5	—	—	—
tin	—	—		—	—	—	—	—
tellurium	—	—		—	—	—	—	—
thallium	2	—		—	—	—	—	—
vanadium	—	—		—	—	—	—	—
zinc	—	5,000	S	120	110	—	120,000	270,000

NOTES

Table includes all detected metals, and VOCs/SVOCs that have standards
MCL=maximum contaminant level; G=MCL goal (MCLG); S=secondary MCL (SMCL)
NOAA - National Oceanographic and Atmospheric Adminstration Sediment Guidelines
Drinking water standards and health advisories apply to ground water;
Ambient Water Quality Criteria apply to surface water
NOAA guidelines apply to sediment
(1) standard for m- and o-dichlorobenzene (75 ug/L for p-dichlorobenzene standard)
(2) standard for total trihalomethanes
(3) standard for cis-1,2-dichloroethene (100 ug/L for trans-1,2-dichloroethene)
(4) copper has an action level of 1,300 ug/L, a SMCL of 1,000 ug/L and a MCLG of 1,300 ug/L
(5) lead has an action level of 15 ug/L

TABLE 3-2: Metals and Pesticides Detected in Background Soils

Site ID				BKG-1	BKG-2	BKG-3	BKG-27	BKG-28	BKG-4	BKG-5	BKG-6	BKG-31
Field Sample ID				B1A0001Y	B1A0002Y	B1A0003Y	B1A0027Y	B1A0028Y	B1A0004Y	B1A0005Y	B1A0006Y	B1A0031Y
Site Type				AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL
Start Depth (ft bgs)				0	0	0	2	2	2	2	2	2
End Depth (ft bgs)				3	3	3	3	3	3	3	3	3
Collection Date				26-Jan-93	26-Jan-93	26-Jan-93	18-Jan-94	18-Jan-94	28-Jan-93	28-Jan-93	28-Jan-93	24-Jan-94
Closest Site				ODA	ODA	ODA	ODA	ODA	CFD	CFD	CFD	CFD
METALS (ug/g)	**MAX**	**MEAN**	**DETECTED**									
Aluminum	27,400	7,762	30 /30	4,680	10,500	8,220	10,500	8,560	10,300	24,900	19,600	1,240
Arsenic	24.8	7.7	10 /30	-	2.86	-	3.61	4.36	3.84	5.02	15.5	-
Barium	183	33.9	30 /30	18.9	36.6	28.4	33.7	24.8	22.2	53.1	44.1	8.21
Beryllium	2.27	1.3	4 /30	-	-	-	-	-	-	1.08	1.29	-
Boron	21.9	12.2	13 /30	12.9	11.8	9.09	-	-	11.1	17	12.1	-
Calcium	19,100	919	25 /30	99.9	103	95.5	42.5	-	-	34.4	-	-
Chromium	49.5	14.3	30 /30	7.7	13.6	10.3	12.7	23	18.2	40.2	49.5	4.29
Cobalt	18.2	5.8	8 /30	-	3.55	-	-	-	2.97	4.96	-	-
Copper	23.6	8.9	22 /30	4.8	5.33	-	4.66	12.3	7.64	16.3	22.8	-
Iron	51,900	14,161	30 /30	5,290	10,400	5,250	12,500	21,800	16,300	42,200	51,900	3,950
Lead	13.5	4.9	30 /30	5.16	5.42	6.3	7.05	6.61	4.54	6.69	7.56	1.36
Magnesium	4,760	653	30 /30	279	776	499	510	297	564	808	251	111
Manganese	1,300	127	28 /30	19.8	62.9	51.6	17.6	-	20.6	86.3	16.8	15.3
Nickel	19.9	6.3	13 /30	-	7.9	4.45	3.88	-	5.86	7.84	5.59	-
Potassium	1,400	437	23 /30	217	555	351	300	480	438	1,400	794	-
Sodium	894	285	4 /30	-	-	-	-	-	-	86.4	62.7	-
Vanadium	101	23.3	30 /30	12	23.3	16.4	20.6	36.9	28.3	61.1	101	7.86
Zinc	60.6	13.6	30 /30	8.84	18.8	12.4	19.4	14.2	14	21.3	12	3.83
Heavy Metals	79	23		13	30	21	27	34	32	61	79	6
Grand Total Metals	72,896	22,447		10,656	22,526	14,554	23,976	31,259	27,741	69,750	72,896	5,342
PESTICIDES (ug/g)												
p,p'-DDE	0.016	0.001	1 /30	--	--	--	--	--	--	--	--	--
Endosulfan II	0.001	0.000	1 /30	--	--	--	--	--	--	--	--	--
p,p'-DDT	0.016	0.003	9 /30	0.006	0.008	0.009			--	--	--	--
Heptachlor Epoxide	0.016	0.004	4 /30	--	--	--	--	--	0.003	--	--	--

NOTES:
Only detected analytes are included on this table, for full data set see the appropriate appendix
Dashes (--) indicate that the analyte is present below detection limits

03-May-94,BKGHITS.WQ1

TABLE 3-2: Metals and Pesticides Detected in Background Soils
Page 2 of 3

Site ID	BKG-7	BKG-8	BKG-9	BKG-10	BKG-11	BKG-12	BKG-13	BKG-14	BKG-16	BKG-17	BKG-18	BKG-22	BKG-23
Field Sample ID	B1A0007Y	B1A0008Y	B1A0009Y	B1A0010Y	B1A0011Y	B1A0012Y	B1A0013Y	B1A0014Y	B1A0016Y	B1A0017Y	B1A0018Y	B1A0022Y	B1A0023Y
Site Type	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL
Start Depth (ft bgs)	2	2	2	2	2	2	2	2	2	2	2	2	2
End Depth (ft bgs)	3	3	3	3	3	3	3	3	3	3	3	3	3
Collection Date	28-Jan-93	28-Jan-93	28-Jan-93	28-Jan-93	28-Jan-93	28-Jan-93	28-Jan-93	28-Jan-93	02-Feb-93	02-Feb-93	02-Feb-93	18-Jan-94	18-Jan-94
Closest Site	HHA	HHA	HHA	IL2	IL2	IL2	FTA	FTA	DSY	DSY	DSY	DSY	DSY
METALS (ug/g)													
Aluminum	4,970	11,400	8,240	7,580	1,910	27,400	2,960	7,730	6,630	7,700	4,350	9,230	3,380
Arsenic	9.87	24.8	-	-	-	-	-	-	-	-	2.83	-	-
Barium	12.9	26.6	35	142	9.49	183	11.3	29.1	31.4	30.1	11.8	37.8	19.3
Beryllium	-	-	-	0.751	-	2.27	-	-	-	-	-	-	-
Boron	8.96	9.25	10.6	21.9	-	10.2	11.1	12.8	-	-	-	-	-
Calcium	129	232	147	19,100	102	1,770	63.3	161	52.3	52	-	38.5	54
Chromium	12.4	18.1	10.6	10.6	11.2	33.1	6.36	11.3	28.6	8.63	17.2	14.4	6.19
Cobalt	-	-	2.94	4.08	5.29	18.2	-	-	-	-	-	4.74	-
Copper	4.94	8.53	4.55	5.29	4.68	13.4	-	-	23.4	5.3	23.6	6.28	-
Iron	19,500	32,600	6,480	9,200	11,800	29,200	4,770	8,530	26,500	11,100	18,400	16,300	5,370
Lead	3.59	5.36	4.17	13.5	5.63	12.4	1.96	4.09	5.11	3.94	2.64	5.27	2.54
Magnesium	207	457	889	4,760	211	3,200	389	741	426	554	230	720	369
Manganese	11.6	-	62.6	1,300	95.9	1,290	31.3	33.8	55.6	49.9	13.4	47.9	49.4
Nickel	-	-	6.11	3.97	3.1	19.9	-	5.16	-	-	-	4.71	-
Potassium	-	333	408	679	192	1,250	241	419	299	242	186	350	-
Sodium	-	-	-	894	-	96.1	-	-	-	-	-	-	-
Vanadium	29.7	31.7	14.6	50.7	14.4	41.8	8.79	15.4	23.3	16.2	16.4	20.1	8.25
Zinc	5.66	7.5	13.4	14	9.59	60.6	7.07	16.6	13.8	15.7	8.25	21.2	8.57
Heavy Metals	26	48	21	29	20	68	8	21	34	13	23	24	9
Grand Total Metals	24,906	45,154	16,329	43,780	14,374	64,601	8,501	17,709	34,089	19,778	23,262	26,801	9,267
PESTICIDES (ug/g)													
p,p'-DDE	–	0.016	–	–	–	–	–	–	–	–	–	–	–
Endosulfan II	–	–	–	–	–	–	–	0.001	–	–	–	–	–
p,p'-DDT	0.006	0.016	–	0.011	–	0.007	0.007	0.015	–	–	–	–	–
Heptachlor Epoxide	–	0.1 G	–	–	–	–	0.016	0.003	–	–	–	–	–

NOTES:
Only detected analytes are included on this table, for full data set see the appropriate appendix
Dashes (--) indicate that the analyte is present below detection limits

TABLE 3-2: Metals and Pesticides Detected in Background Soils
Page 3 of 3

Site ID	BKG-19	BKG-20	BKG-21	BKG-29	BKG-30	BKG-24	BKG-25	BKG-26
Field Sample ID	B1A0019Y	B1A0020Y	B1A0021Y	B1A0029Y	B1A0030Y	B1A0024Y	B1A0025Y	B1A0026Y
Site Type	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL
Start Depth (ft bgs)	2	2	2	2	2	2	2	2
End Depth (ft bgs)	3	3	3	3	3	3	3	3
Collection Date	02-Feb-93	02-Feb-93	02-Feb-93	24-Jan-94	24-Jan-94	19-Jan-94	19-Jan-94	19-Jan-94
Closest Site	ASL	ASL	ASL	ASL	ASL	SL	SL	SL
METALS (ug/g)								
Aluminum	4,610	4,330	1,650	3,600	5,380	4,010	3,790	3,520
Arsenic	-	-	-	-	-	-	4.62	-
Barium	17.6	35.2	11.1	16.1	17.6	20.8	14.4	33.8
Beryllium	-	-	-	-	-	-	-	-
Boron	-	-	-	-	-	-	-	-
Calcium	37.9	42.4	30.1	43	44.3	166	59.9	265
Chromium	6.41	5.38	3.94	6.28	11.4	7.77	8.52	11.6
Cobalt	-	-	-	-	-	-	-	-
Copper	4.93	5.41	3.65	-	-	3.57	3.7	-
Iron	7,580	6,690	4,990	6,100	8,570	6,970	7,010	7,590
Lead	3.13	2.72	2.06	2.93	3.04	2.69	2.89	6.34
Magnesium	385	367	126	334	312	373	266	185
Manganese	39.4	26	19.4	22.9	24.2	32.2	32.3	40.3
Nickel	-	-	-	-	-	3.16	-	-
Potassium	239	209	-	-	-	176	-	292
Sodium	-	-	-	-	-	-	-	-
Vanadium	12.1	12	8.79	9.51	15.8	11.7	10.2	19.6
Zinc	8.27	7.57	3.82	8.1	9.26	8.72	10.2	23.9
Heavy Metals	10	8	6	9	14	14	16	18
Grand Total Metals	12,944	11,733	6,849	10,143	14,388	11,786	11,213	11,988
PESTICIDES (ug/g)								
p,p'-DDE	--	--	--	--	--	--	--	--
Endosulfan II	--	--	--	--	--	--	--	--
p,p'-DDT	--	--	--	--	--	--	--	--
Heptachlor Epoxide	--	--	--	--	--	--	--	--

NOTES:
Only detected analytes are included on this table, for full data set see the appropriate appendix
Dashes (--) indicate that the analyte is present below detection limits

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4.0 Physical Characterization and Contaminant Assessment of the DPDO Salvage Yard and Transformer Storage Area (DSY)

4.1 Introduction and Background

The DPDO (currently known as the DRMO) Salvage Yard and Transformer Storage Area (DSY) is located off Remount Road south of Rock Avenue and immediately north of Route 32 (Figures 1-2 and 4-1). The facility is used as a storage area for a variety of equipment, including discarded vehicles, electrical transformers, electronic equipment, heating and cooling units, pipes, dumpsters, and scrap metals. During an Arthur D. Little site visit (Arthur D. Little, 1992), approximately seven transformer bodies and 15 transformer insides were observed on pallets immediately inside of the salvage yard gate. The majority of the bodies were labeled "no PCBs" or "<10 ppm PCBs." One body was labeled "27 ppm PCBs." The site includes approximately eight acres and is generally not vegetated.

An SI was conducted for this site in 1992 (EA Engineering, Science and Technology, 1992b). The results of that investigation are summarized below. However, for a detailed description of the investigation, refer to that document.

During the SI, one deep well and two shallow monitoring wells were installed along the south boundary, between the DSY south fence and Route 32. All of the SI wells were installed south of the DSY and screened in the lower Patapsco, which acts as an unconfined water table aquifer in this area. Ground water samples were collected from the three new monitoring wells and one existing well, COE-1.

During the SI, ground water flow was evaluated using the three new wells, COE-1, and three existing piezometers. The direction of ground water was determined to flow from the west toward the east/northeast.

VOC contamination was detected in the two shallow, upgradient wells (MW-42 and MW-43S) and not in either the deep well (MW-43D) or the existing well (COE-1). The MCL for PCE was significantly exceeded at MW-42, which is located west of the well cluster MW-43S and MW-43D. Low levels SVOCs (MW-43D) and pesticides (MW-43D and COE-1) were detected but none of these compounds exceeded MCLs. Chromium and lead contamination exceeding the MCL or Action Level was detected at MW-42 and COE-1.

VOC contamination was detected in the upgradient monitoring wells with the higher concentrations detected at MW-42, which is further upgradient. The location of the source of contamination and extent of the contaminant plume were not determined during the SI.

Low concentrations of pesticides and PCBs were detected in the soil sample collected near the transformer storage area. In an earlier study (USAEHA, February 1992), significant PCB contamination was detected in the soils located in the southwestern corner of the property. Contamination was determined to extend to a depth of 5 feet in some areas.

4.2 Summary of Investigation for Study Area

The overall objectives of the SIA field investigation at the DSY were to (1) further characterize the presence of PCBs in soil near the transformer storage area; (2) provide further information regarding the location of the contaminant source and to monitor ground water quality downgradient of the previously detected contamination; and (3) confirm the presence or absence of previously detected ground water contamination by resampling all existing wells. The tasks conducted to achieve these objectives included:

- Completion of a down-hole survey for UXO
- Installation of two additional shallow (lower Patapsco) monitoring wells
- Analysis of eight ground water samples from the water table aquifer (lower Patapsco); seven samples were to be collected close to the surface of the aquifer and one was to be collected close to the bottom of the aquifer
- Analysis of six surface soil samples for PCBs

Two monitoring wells were installed with their screened intervals intersecting the water table. MW-200 was installed along the southern boundary of the DSY, approximately 300 feet west of MW-42. The purpose of this upgradient well was to determine if contamination extends west of the known contamination at MW-42 and to delineate the contaminant plume. A second shallow well, MW-201, was installed downgradient of MW-42 and MW-200 to evaluate if the contaminant plume is migrating with ground water. All sampling locations are illustrated on Figure 4-1.

A total of eight ground water samples were proposed to be collected, two from new monitoring wells, four from existing monitoring wells, and two from existing piezometers. Ground water samples were not collected from either of the piezometers because the diameter of the piezometers' PVC risers was too narrow for sampling equipment capable of collecting a representative sample.

Due to a proposal to erect a building encompassing most of the area where MW-201 was proposed, approval was granted to install the well with the expectation that it will be lost when the building construction begins.

During the 1992 SI, low levels of PCBs were detected in the transformer storage area of the DSY. A study conducted by the U.S. Army Environmental Hygiene Agency (1991) indicates that high levels of PCBs are present in the southwest corner of the property; however, this information was not available prior to the 1993 SIA field activities. Therefore, a total of six surface soil samples (0 to 6 inches) were collected from the transformer storage area in the northeast portion of the property to evaluate the presence of PCBs in this area of the DSY.

4.3 Physical Characterization of the Study Area

4.3.1 General Description

The DSY is predominately covered by barren ground and impervious surfaces (roads and buildings). This property is used as a developed material-staging/disposal area. The site is primarily unvegetated; however, the areas adjacent to the northwestern and western portions of the site are fairly vegetated. The property is divided into two yards that are separated by a fence. The northernmost yard is completely enclosed by the fence whereas the southernmost yard is only surrounded on three sides by the fence. The western boundary of the southern yard opens to a wooded area. A hill on which a fence is placed bounds the southernmost border, with the DSY yards located approximately 10 feet below on the northern side, and Route 32 is approximately 20 feet below on the southern side.

Items that can be used for scrap metal, e.g., excess cars, tanks, and household appliances, are stored here. Other items including unused toilets, inert ordnance used for training, and transformers were observed. There are no paved roads inside the DSY yards and the access paths change as piles of debris and materials are moved around the yards. Access into the DSY yards can be gained through locked gates located along the eastern border. Because of the scrap metal and frequent thefts, the gates remain locked at all times except during business hours while work is conducted in the yards. Activity within the yards varies weekly.

4.3.2 Geology

The DSY's location suggests that it is situated on the lower Patapsco Formation, which is described as consisting of fine, silty sand grading downward into a coarse medium sand with minor silt. The geotechnical samples collected from the DSY during the SIA are primarily well sorted, medium- to fine-grained sand with silt and clayey silt lenses to a depth of 61 feet. The soil characteristics described in the SIA soil boring logs deviate slightly from the soil summary provided during the SI; however, the soil characterizations described in the SIA field logs are representative of the lower Patapsco Formation. The soil descriptions provided for MW-43S and MW-43D, which are located further to the east, best represent the lower Patapsco Formation according to the Maryland Geological Survey. The differences in the descriptions are likely the result of variable interpretation, including: soil color, grain

size, sorting, and differentiating silts and clay. Additionally, the SI (EA Engineering, Science and Technology,1992b) reported the presence of a clay lens at a depth of 25 feet, which was not encountered during the 1993 SIA; however, this can be accounted for by the distance between the wells.

4.3.3 Hydrogeology

The unconfined aquifer present at the DSY is the lower Patapsco aquifer. All of the shallow monitoring wells at this location have their screened intervals intersecting the water table. One deep well is screened 46 feet into the water table but is still in the lower Patapsco aquifer. The explanation provided in the SI for the construction of the deep well was evaluation of the lithology (EA Engineering, Science and Technology, 1992b).

A complete round of depth-to-water measurements was collected on February 23, 1993. The measurements are reported along with their corresponding water level elevations on Table 4-1. Ground water elevations ranged from 119.92 to 137.96 feet MSL. Water level elevations in the clustered shallow and deep wells are similar. This indicates that there is no significant vertical hydraulic gradient.

In determining the direction of ground water flow, some unusual findings were reported with regard to the water levels in wells located along the southern boundary. The depth to water at MW-200 was significantly lower than in the neighboring wells. If the water level at MW-200 was excluded from the water level survey, the direction of ground water flow would concur with the east/northeasterly direction concluded in the SI. However, MW-200 cannot be excluded as a data point and thus raises the question about the difference in its water level measurements. Several possible explanations were offered for these observed inconsistencies and consequently investigated to evaluate their feasibility.

The proposed explanations for the observed differences included (1) surveying error, (2) error in transcription of depth-to-water level measurements by Arthur D. Little, (3) a subsurface geologic trough, (4) nearby pumping wells in the water table aquifer creating a drawdown curve in the area of the DSY, and (5) a subsurface ground water mounding at MW-43S and MW-43D from a nearby drainage ditch. The following steps were taken to evaluate each of the proposed theories:

- The surveyors were contacted and asked to verify that the coordinates they gave Arthur D. Little were correct. The survey data were originally reported in dadum NAD 83 and had to be converted to NAD 27 so that they could be manipulated to generate maps. After the survey data were converted the points were consistent with the survey data provided from the SI.

- The depth to water level measurements entered into the field log books, soil boring logs, well development logs, and water sampling logs were compared to determine whether any errors in transcription occurred. All four readings were consistent, thus error due to transcription or mismeasurement was eliminated as a likely cause.

- The Maryland Geological Survey was contacted to determine whether there is any information available about this aquifer with respect to ground water flow and subsurface terrain. MGS stated that the ground water flow in the lower Patapsco is well documented for the southern part of the state; however, very little information about ground water flow and subsurface geology is available for the northern part of the state.

- The FGGM Water Treatment Facility was contacted to determine whether there are any production wells located in the lower Patapsco aquifer close to the DSY that could be influencing the ground water flow. All of the FGGM production wells are situated in the lower confined aquifer, the Patuxent, and would therefore be unlikely to create a drawdown curve in the lower Patapsco aquifer.

- During a recent site visit, a drainage ditch was observed along Route 32, below MW-43S and MW-43D. This drainage ditch collects surface water runoff from the road and directs it in an easterly direction adjacent to the DSY property. Significant amounts of precipitation could cause mounding to occur in this area resulting in the depth-to-water measurements in these wells to be unnaturally high. This may result in MW-200 appearing to be low when it is representative.

The ground water contour map presented as Figure 4-2 excludes the water level data from MW-200. The resulting map is consistent with the SI report. If MW-200 is included, the contour lines are bent around MW-200, creating a ground water trough trending northeast-southwest.

Thus, the direction of ground water flow at this site cannot be concluded with a high degree of certainty. Because of the uncertainty regarding the depth-to-water measurement at MW-200, the contour map presented excludes the elevation at this location. Further investigation is needed at this site to understand the relationship between the elevation measurements at MW-200 and ground water flow direction. If the water level at MW-200 is consistent with the subsurface geology at this site, it is possible that ground water underneath the DSY is flowing toward MW-200.

4.4 Nature and Extent of Contamination

During the SIA field investigation, soil and ground water samples were collected to evaluate the nature and extent of contamination. The results of these sampling efforts are described below. The data tables presented in this section provide a summary of the samples in which analytes were detected. A complete summary of the data for each sample can be found in Appendix H. Table 4-2 provides a complete summary of the laboratory samples collected at the DSY, including site IDs, site types, media codes, and analytical parameters.

4.4.1 Soil

Six shallow (0 to 6 inches) soil samples were collected from the transformer storage area and analyzed for PCBs. Historically, PCBs have been added to oils stored in transformers because of their low flammability properties. PCBs have been reported in soil samples collected from the DSY during previous investigations. The locations for these samples are illustrated in Figure 4-3.

PCB Aroclor 1260 was detected in all of the surface soil samples but one (Table 4-3), which was collected from the transformer storage area. This is the same PCB identified during the SI (EA Engineering, Science and Technology, 1992b). The highest concentration of PCBs measured during the 1993 SIA was 4 mg/kg at SS-201. This is below the action limit of 50 mg/kg established by EPA under TSCA.

Two separate investigations of the DSY property were conducted in 1991: an SI was conducted by EA Engineering, Science and Technology and PCB investigation was conducted by the U.S. Army Environmental Hygiene Agency (USAEHA, 1992). The PCB concentrations detected during the 1993 SIA were consistent with the PCB results reported by EA during the 1991 SI. USAEHA collected samples, at three different depths, from 32 locations throughout the property. The action level was exceeded at one sample location, SS-27, located in the southernmost lot, southwest of the 1993 investigation area. The total PCB concentration measured in SS-27 was 92.99 mg/kg with 83.5 mg/kg found in the 1 to 3 foot interval. The radial extent of contamination was not determined during the USAEHA investigation.

During the SIA, the radial extent of contamination was not evaluated because the details of the USAEHA report were not available to Arthur D. Little until after the field sampling was completed. The locations of the soil samples collected during the SIA were based upon visual inspection of soil staining and proximity to transformers and storage. A site "walk over" was conducted of the shed storage yards; however, no indications of PCB contamination staining were noted. PCB contamination is not likely to be an issue in the northeastern portion of the property where transformers are stored.

4.4.2 Ground Water

Six ground water samples were collected and analyzed for VOCs, SVOCs, and total and dissolved metals.

Field Parameters: During the sampling process, field measurements were made of the ground water for pH, conductivity, temperature, and turbidity. The field parameters are indicative of general water quality and are included on Table 4-4.

Field parameter data are obtained, for ground water sampling, to ensure that the samples are representative of the aquifer. Field parameters are also collected for surface water and leachate. Although there are no established values for comparison with the field parameter, ranges are available for the ground water which can be used as general guidelines:

- pH normally ranges from 6 to 8.5 in natural ground waters. More acidic water may exist in the presence of some metal reactions (i.e., oxidation of sulfides) (Hem, 1985).
- Conductivity can range from 0.5 umho/cm^2 in very pure water to 6,000 umho/cm^2 in ground water with a high chloride, sulfate, or carbon concentrations (Hem, 1985).
- Temperature varies with season, depth to water, and recharge conditions. Ground water generally is 1 to 2°C higher than the local mean temperature. Based on nationwide climate data, ground water in Maryland should be in the range of 10 to 15°C (Todd, 1980). However, ground water was often slightly cooler, probably because the samples were collected during the winter and the depth of water was shallow.
- Turbidity has a wide range depending upon the amount of silt or fine material in the ground water. At FGGM, the ground water ranged from below to above instrument detection (reported as '>999'). Given the range in sample clearness, this range appears acceptable.

For ground water samples from the lower Patapsco aquifer, pH ranged from 4.21 to 4.85. Conductivity ranged from 0.181 to 0.778 μmhos/cm^2. Temperature ranged from 9.8°C to 12.7°C. Turbidity ranged from below detection to greater than 999 NTUs. None of the measurements was for outside of the expected range; no trends were observed.

Volatile Organic Compounds: Volatile organic compounds (VOCs) have many applications ranging from cleaning and degreasing solvents to refrigerants, fumigants, propellants, and adhesives. These compounds can also be used as a component of

synthetic fibers and in fire extinguishers (Sax and Lewis, 1987). These compounds are frequently used in both domestic and industrial products and, over time, they can be degraded, allowing for a wide range of VOCs to be present. Because industrial and household items are stored at the DSY and due to the presence of VOCs in past sampling rounds, six ground water samples were collected and analyzed for 41 VOCs. A total of six VOCs were detected and are summarized on Table 4-5 along with their respective MCLs.

All of the VOCs detected in ground water were halogenated organics, typically used as solvents, refrigerants, and in fire extinguishers. The specific VOCs identified include primary halogenated ethanes and ethenes [PCE, 1,1,1-trichloroethene (TCA), 1,1-dichloroethene (1,1-DCE)] trichloroflouromethane (known as Freon-11), carbon tetrachloride, and chloroform. Figure 4-4 illustrates the concentrations and distribution of the detected VOCs. The representative chemical classes of the VOCs identified during the SIA and their distribution are analogous to the results of the SI (EA Engineering, Science and Technology, 1992b). The following observations can be made after comparing the 1993 data and the 1991 data:

- VOC contamination was not present above the detection limits at the deep on-site well (MW-43D) in either study.
- The highest concentration of VOCs are located in the southwest corner (MW-200 and MW-42).
- During the 1993 SIA, PCE, TCA, DCE, and Freon 11 were detected in samples from MW-42. Only PCE and TCA were detected previously. PCE exceeds the MCL in both samples, however its concentration has decreased slightly since the 1991 SI. The TCA concentration has increased slightly since the 1991 SI but its concentration continues to be below the MCL. During the 1993 SIA, DCE exceeded the MCL criteria.
- During the 1993 SIA, carbon tetrachloride and PCE were detected at MW-43S; these compounds were not previously reported at this location. Neither of these compounds exceeded their MCL.

In general, comparison of the data from the two investigations reveals an overall increase in total VOCs. Of the existing wells, little change was observed in the analytical data.

The highest total VOC concentration measured during the SIA was greater than 180 µg/L detected at MW-200; however, MW-200 was installed during the SIA, thus no previous information is available at this location. The next highest total VOC concentration was 101 µg/L detected at MW-42, which was the location of the

highest VOC concentration during the SI (72 μg/L). Table 4-5 provides a summary of the VOCs found in ground water and Figure 4-4 illustrates the locations of each individual VOC. VOCs were not detected at either COE-1 or MW-43D during the SIA or the SI.

Two compounds were present at concentrations that exceeded their MCLs. PCE was present above its MCL in two locations (MW-42 and MW-200) and 1,1-DCE at one location (MW-42). Both MW-42 and MW-200 are located along the southern fence, which is believed to be upgradient of the property. The maximum concentrations for the two compounds in excess of MCLs are shown below.

Maximum Concentrations, μg/L			
VOC	**1991 SI**	**1993 SIA**	**MCL**
1,1-DCE	ND	12	7 μg/l
PCE	50.90	>150	5 μg/L

As illustrated by the table above, the maximum PCE and 1,1-DCE concentrations detected during the SIA are higher than the concentrations detected during SI.

Semivolatile Organic Compounds: Semivolatile organic compounds (SVOCs) are used in a variety of compounds including pesticides, tars, oils, and other petroleum products. Because a variety of materials are stored at the DSY, six ground water samples were analyzed for 116 SVOCs, of which one was detected (Table 4-5). Figure 4-4 illustrates the distribution of SVOCs at the DSY.

Low concentrations of bromacil, a pesticide, were detected in MW-43S and MW-201. There are no regulatory limits in ground water for this compound. No other SVOCs were detected.

Metals: Metals are naturally occurring elements that are frequently used to construct a wide variety of industrial and household goods. Metals are also commonly used in paints and pigments. Because of the large amount of scrap metal, inert bombs, and equipment stored at the DSY, the potential for significantly elevated metals concentrations exists. Therefore, ground water samples were analyzed for 27 metals, both total and dissolved (filtered). Nine metals were not detected in any of the samples: antimony, cadmium, molybdenum, nickel, selenium, silver, tellurium, thallium, and tin. Metals that were detected are summarized on Table 4-4 along with their respective MCLs. The distribution of the two metals exceeding the MCL or action level, lead and chromium, is illustrated in Figure 4-5.

Metals were detected at every sampling location; however, the highest total concentrations were observed in the wells located along the southern boundary.

Total chromium exceeded its primary MCL and total lead exceeded its action level. Chromium MCL exceedences and near exceedences for lead action levels were reported in samples from the shallow, southern boundary wells installed during the SI. No metals MCL or action level exceedences were reported in the monitoring wells installed during the 1993 SIA. The method detection limit for antimony (60 μg/L), thallium (125 μg/L), and cadmium (6.78 μg/L) are above MCLs (6 μg/L, 2 μg/L, and 5 μg/L, respectively) and therefore some of the nondetect results for these compounds may exceed the MCL. The MCLs for aluminum and manganese were exceeded by total and dissolved metal concentrations at all wells except at MW-200 and MW-43D. At MW-34D, the MCL for aluminum was exceeded in the total metals only. The MCL for iron was exceeded by total metals in every shallow well and it was nearly exceeded in the dissolved metals for COE-1.

Nearly all of the MCL exceedences were for total metals; however, the concentration of dissolved chromium measured at MW-42 (98.1 μg/L) is just under the MCL (100 μg/L).

The chemical data were also compared to the previous sampling results to determine if the concentrations were within the previous range. In total, 20 concentrations exceeded their previous maximum (three were measured in the new wells) and 16 concentrations fell below their previous minimum. Significant increases in chromium (MW-42 and MW-43S) and mercury (MW-43) were observed.

As discussed in Section 4.3.3, the ground water flow direction and the source locations are not well understood; therefore, no well is currently identified as representing upgradient or background water chemistry. Without an unimpacted well for determining background metals concentrations, it is difficult to determine which metals are present at elevated concentrations.

4.5 Contaminant Assessment

During the 1993 SIA, the primary contaminants of concern identified in ground water at the DSY were halogenated VOCs, lead, and chromium. These compounds were identified during the 1991 SI and continue to be detected in the shallow monitoring wells located along the southern boundary of the property. Two additional VOCs, trichlorofluoromethane and carbon tetrachloride, were detected for the first time in samples collected during the SIA.

Excluding MW-200 as a data point, ground water appears to flow to the north. The extent of contamination and the source of contamination are not known. It appears that the source is most likely located along the DSY's southern boundary or is off site. The downgradient edges of the plume, as well as the source, have not been clearly defined; however, VOC contamination significantly decreases to the east and northeast. The absence of VOC contamination at MW-43D indicates that the contamination has attenuated with depth. If MW-200 is not excluded as a data point, it is possible that the contaminant source exists in or at the edge of the DSY.

The implications of the new data are:

- The source of VOC contamination in still unknown.
- The source is continuing to discharge contamination into ground water and maximum total VOC concentrations may be increasing.
- The upgradient and downgradient edges of the VOC plume are not known.
- The direction of ground water is not understood with a significant degree of confidence.
- If the water level in MW-200 is representative, ground water may be flowing from underneath the DSY toward MW-200. The highest concentration of total VOCs was found in this well, supporting this theory.

4.6 Data Gaps and Recommendations

The primary objectives of the SIA at the DSY were to (1) confirm the presence or absence of previously detected ground water contamination, (2) provide further information about the location source of the contamination, and (3) establish with certainty the flow direction for ground water because of this site's close proximity to the BRAC parcel. During the SIA, the presence of VOC contamination was confirmed and additional data gaps were identified. The most notable data gaps relate to ground water flow direction and source location.

The reasons for the importance of the anomalies discovered at MW-200 are multifold. First, the direction of ground water flow cannot be determined with any degree of certainty. If MW-200 is excluded in the ground water contour map, the ground water flow direction is northward; otherwise the flow may be southward. It is possible that the water levels along Route 32 may be influenced by hydraulic conductivities, seasonal fluctuations, or surface water drainage from the highway, but no data currently exist to evaluate their influences.

Due to the uncertainty of the direction of ground water flow and the high concentration of VOCs detected at MW-200, it is unclear exactly which direction is

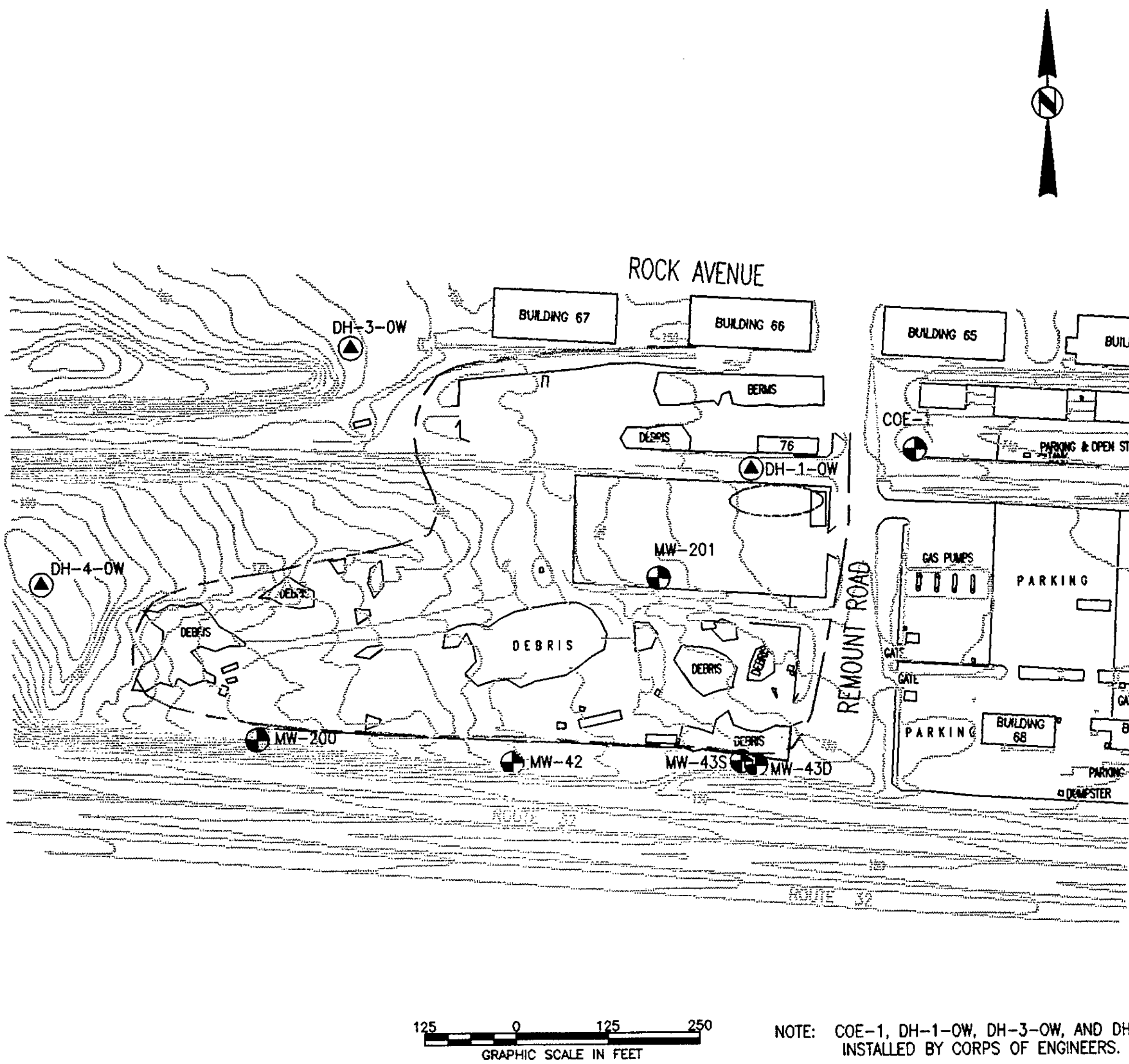
downgradient. If the ground water is flowing southward, it is possible that contamination from the DSY is flowing onto the BRAC parcel.

The source and extent of VOC contamination is unknown at present. Further investigation is necessary to resolve the potential issues described above. The following are proposed actions and rationales suggested to address the data gaps identified during the SIA. The USAEC is conducting a RI at the DSY which will include a detailed evaluation of site conditions. Work plans for that effort are expected to be released in May 1995 and detail the sampling and analysis program for the site.

Data Gap	Proposed Action	Rationale
1. The hydraulic conductivity of the screened materials at MW-200 is unknown and may have an effect on relative water levels.	• Conduct hydraulic conductivity tests in new wells and existing wells: MW-42, MW-43D, and MW-43S.	• Differences in hydraulic conductivity may affect flow and therefore be the cause of the unusual water level measurement.
2. The drainage patterns along Route 32 may result in ground water mounding at MW-42 and MW-43; if mounding exists, it may be responsible for the unexplained water levels along Route 32.	• Install recording devices in MW-200 and MW-42 and monitor water levels weekly for one year. • Collect precipitation data for comparison to the water levels.	• Comparison of the water levels against each other and against precipitation data will indicate if the water levels stay constant relative to each other or if they are influenced by infiltration due to surface drainage; if drainage patterns are affecting the water levels, it may mean that the ground water flow direction at the DSY is not to the north but may be flowing onto the BRAC parcel.
3. The effect of seasonal fluctuations on ground water flow directions is unknown.	• Collect water level measurements quarterly in all on-site wells plus six wells at inactive landfill #4 for a one-year period.	• Quarterly data can be used to determine if seasonal fluctuations are occurring; the additional wells will provide data on a larger scale base area. • The recording data collected for data gap #2 will also be evaluated regarding potential seasonal changes.

Data Gap	Proposed Action	Rationale
4. Depending upon the ground water flow direction, the area south of Route 32 may be either up or downgradient of the source; if ground water flow is northward, than the source area may be located south of the site; if ground water flow is southward, then contamination may be flowing from the DSY to the BRAC parcel.	• Advance a maximum of seven borings south and east of Route 32; locations will depend upon field screening readings. • Collect ground water samples during drilling and screen for VOCs on-site. • Conduct VOC screening of selected soils with elevated PID headspace readings. • A maximum of three monitoring wells will be installed; their locations will be based on the field screening, however, one well will be located approximately south of MW-200 for water level readings.	• Field screening data will be used to locate the extent of the plume to the south (assuming southern flow) or to help identify the source (assuming northern flow). • The ground water field screening provides timely data for evaluation of (a) whether a well should be installed, and (b) locations for the remaining borings; the field screening data are necessary to direct the field program and to limit the necessary number of permanent wells. • The soil screening will help identify potential source materials. • The well located south of MW-200 is needed to evaluate water levels in the vicinity of MW-200.
5. The extent of ground water contamination west of MW-200 is unknown; currently, the westernmost sampling point has the highest concentrations of VOCs.	• Install one monitoring well west of MW-200. • Collect water level data and ground water samples.	• The water level data are needed to evaluate the ground water contours in the vicinity of MW-200. • The chemical data are needed to evaluate the extent of the plume west of MW-200.
6. The extent of ground water contamination north of the DSY is unknown.	• Install a monitoring well north of MW-200 and west of MW-201. • Advance a maximum of three borings north of the DSY along Rock Avenue; one of the borings will be installed as a monitoring well dependent on the results of ground water samples analyzed on site.	• The monitoring well located west of MW-201 is needed to evaluate the western extent of the plume and to help clarify water levels in the vicinity of MW-200. • The three northern borings are intended to identify the northern boundary of the ground water contamination; the well will provide chemical and water level data and will be a replacement for the piezometers DH-3-OW and DH-1-OW that could not be sampled.
7. The plume is not well delineated and has not been evaluated seasonally.	• Collect quarterly samples from new and existing DSY wells for one year. • Analyze all samples for VOCs and metals; new wells will be sampled for SVOCs during the first round but, assuming no SVOC contamination is detected, will only be sampled for VOCs and metals in subsequent rounds.	• Data from the existing wells are necessary to confirm the previous results; data are needed from both the new and existing wells to define the extent of the contamination. • A full year of data is necessary for evaluating trends and seasonal fluctuations.

Data Gap	Proposed Action	Rationale
8. UXO may be present in the subsurface.	• Conduct UXO clearance for all new sampling points.	• UXO present a safety concern that requires both downhole and surface clearances.
9. Location/elevation data are needed for interpretation of hydrologic conditions.	• Survey in the new wells.	• Location information is needed for data entry into IRDMIS. • Elevation data are needed for construction of ground water contour maps.
10. A record of decision (ROD) may be needed for site completion.	• Conduct ecological and human health risk assessments (additional surficial soil data may be required to complete). • Complete a feasibility study and a proposed plan.	• Additional items are required for a ROD.

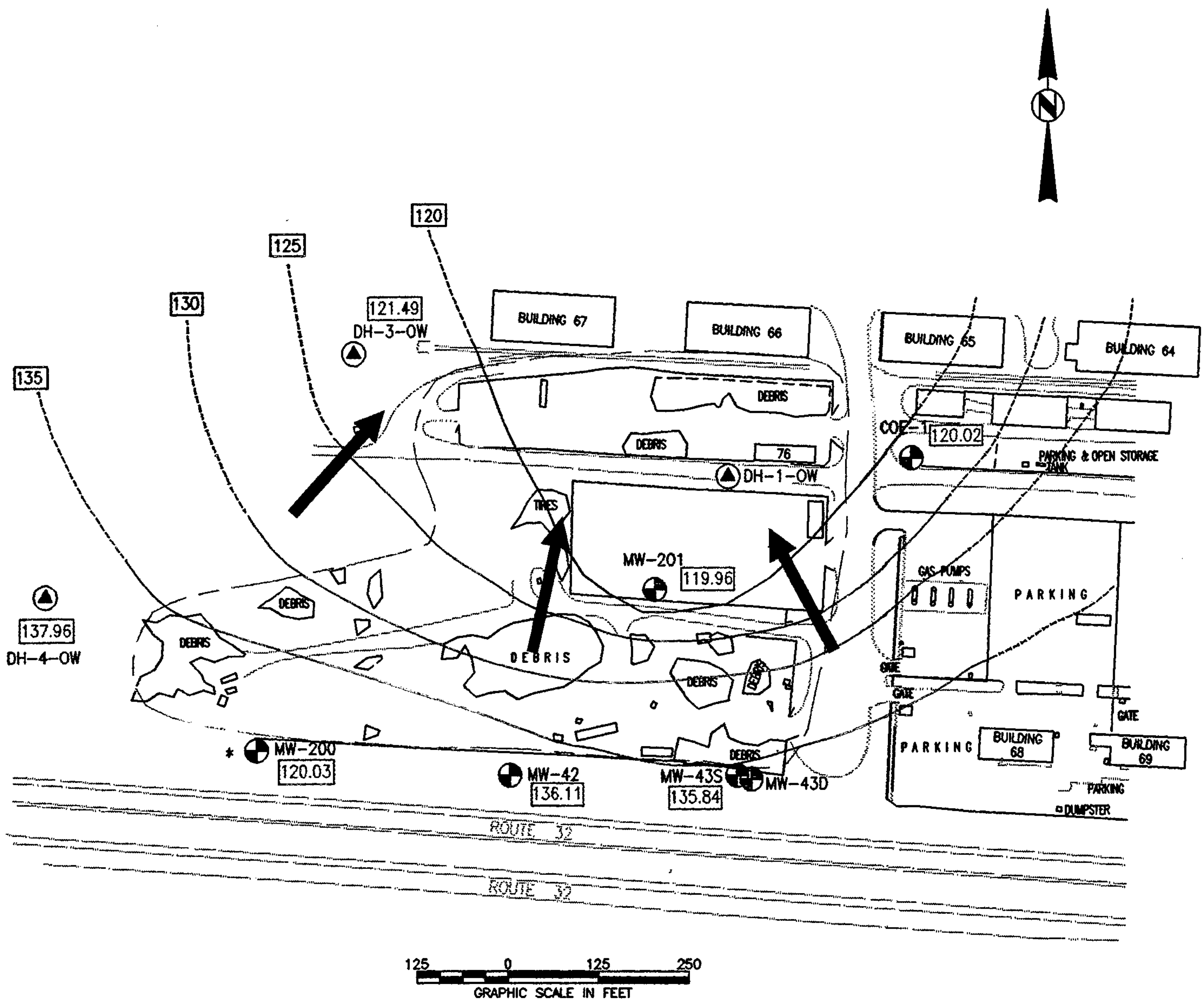


NOTE: COE-1, DH-1-OW, DH-3-OW, AND DH-4-OW INSTALLED BY CORPS OF ENGINEERS.

LEGEND

	TOPOGRAPHIC CONTOUR
MW-42	MONITORING WELL LOCATION
DH-4-OW	PIEZOMETER LOCATION
	APPROXIMATE LIMIT OF DPDO SALVAGE YARD
	TRANSFORMER STORAGE AREA

PREPARED FOR: USAEC		SOURCE: USAEC, 1992	TITLE: FIGURE 4-1: DPDO SALVAGE YARD SITE LAYOUT AND SAMPLING LOCATIONS
DATE: NOV 1993	SCALE: 1"=250'	DWG. NO.: 67069030	Arthur D Little



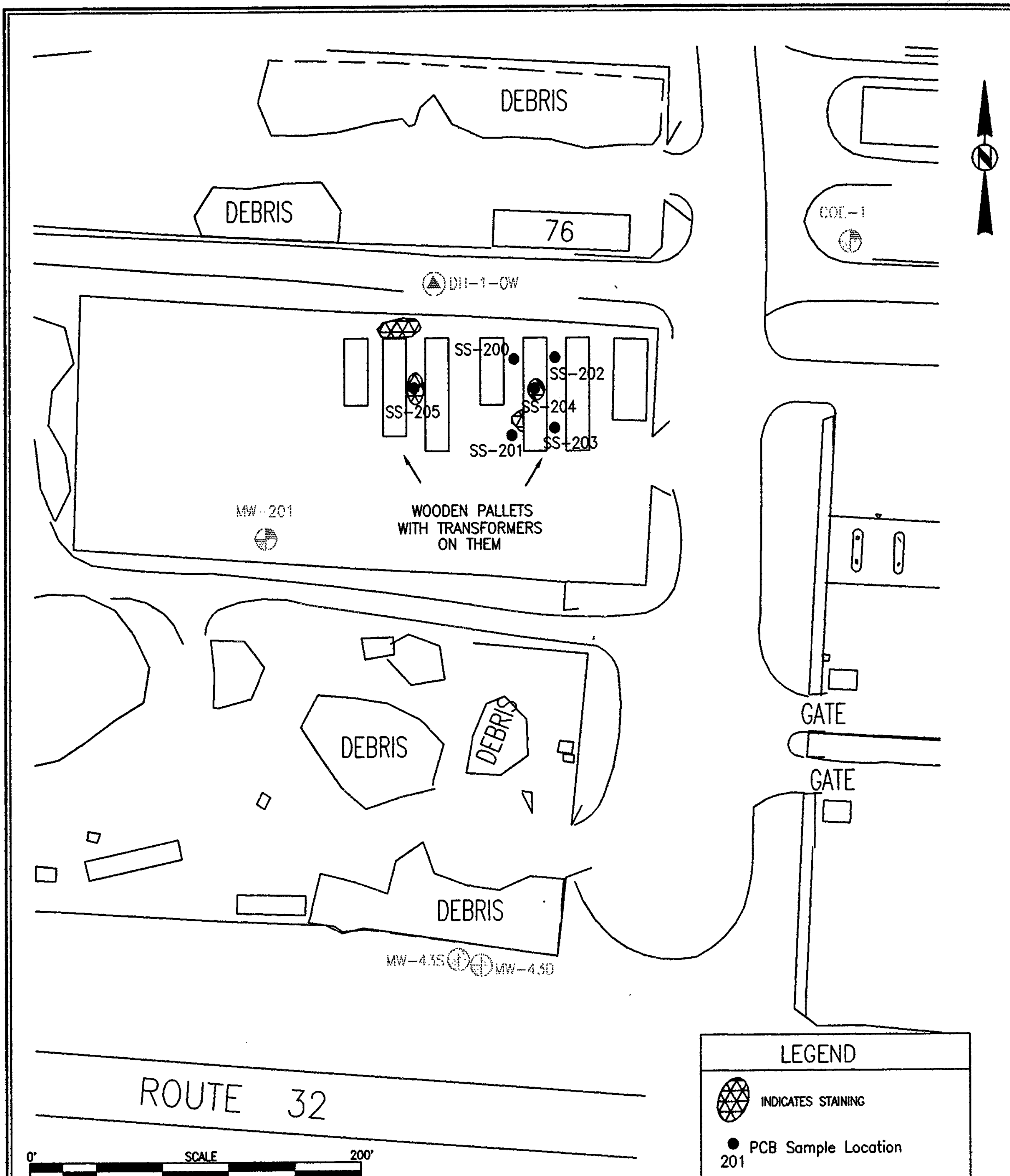
LEGEND

121.49 MW-42	MONITORING WELL LOCATION AND WATER ELEVATION (ft AMSL) MEASURED ON 2/23/93
121.49 DH-4-OW	PIEZOMETER LOCATION AND WATER ELEVATION (ft AMSL) MEASURED ON 2/23/93
	APPROXIMATE LIMIT OF DPDO SALVAGE YARD
135	WATER ELEVATION (ft AMSL)
135	INFERRED WATER ELEVATION (ft AMSL)
	DIRECTION OF GROUND WATER FLOW

NOTE: COE-1, DH-1-OW, DH-3-OW, AND DH-4-OW INSTALLED BY CORPS OF ENGINEERS.

* THIS MAP EXCLUDES DATA FROM MW-200

PREPARED FOR: USAEC			SOURCE: USAEC, 1992	TITLE: FIGURE 4-2: DPDO SALVAGE YARD GROUND WATER CONTOUR MAP
DATE: NOV 1993	SCALE: 1"=250'	DWG. NO.: 67069003	Arthur D Little	



PREPARED FOR:
USAEC

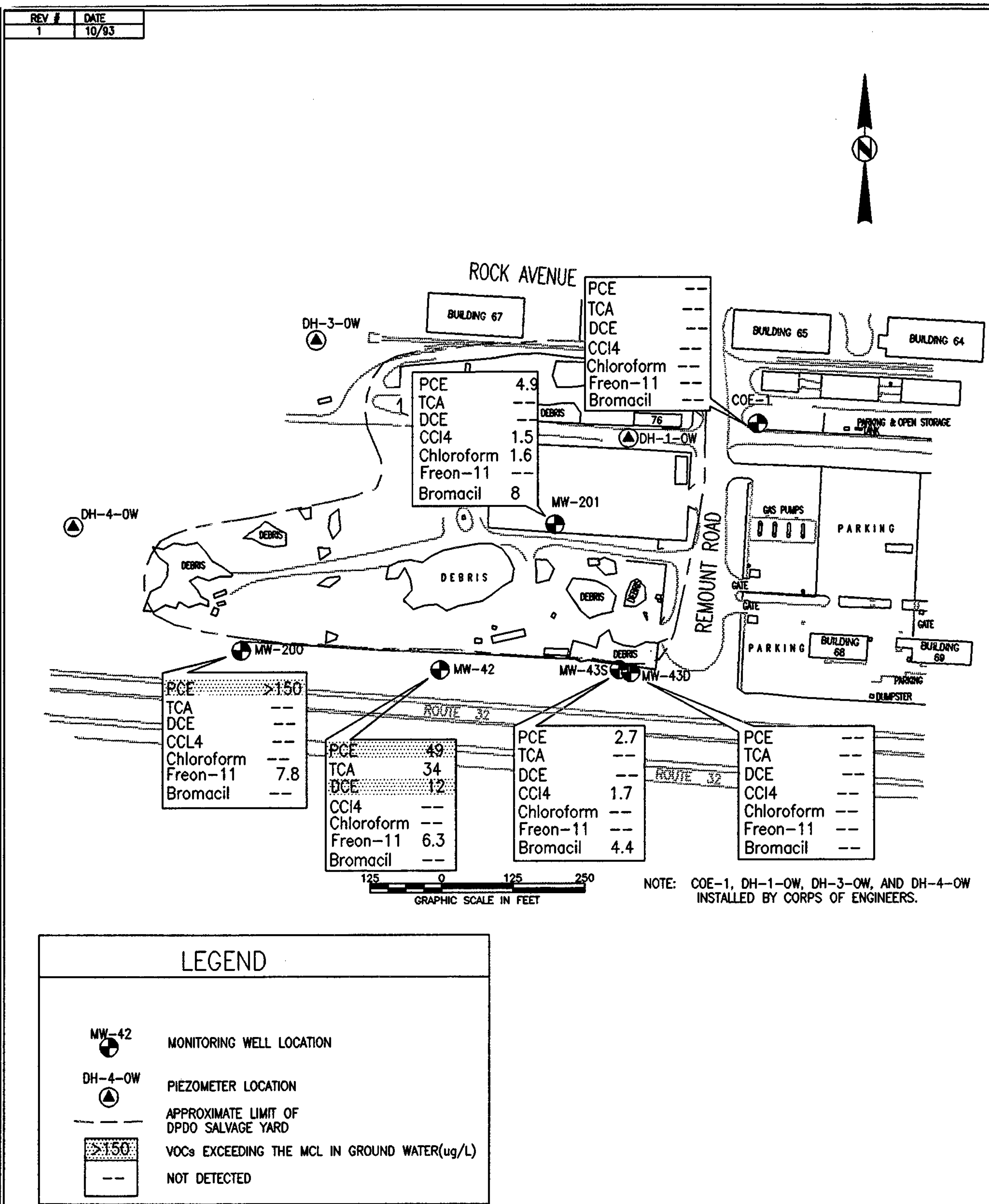
DATE:
JUNE 1993

DWG. NO.:
67069016

SCALE:
AS SHOWN

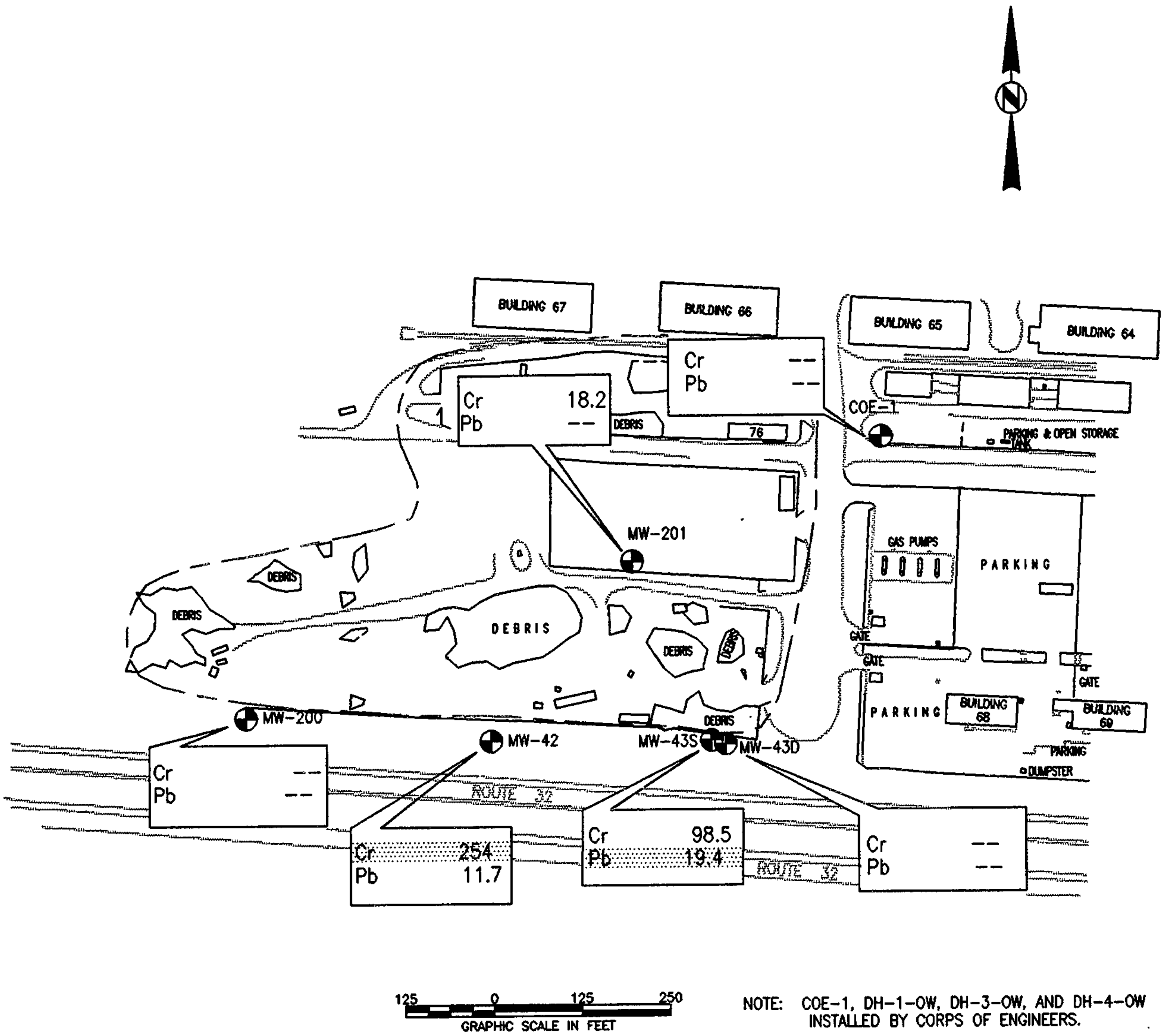
Arthur D Little

TITLE:
FIGURE 4-3
DPDO SALVAGE YARD
PCB SAMPLE LOCATIONS



PREPARED FOR: USAEC		DRAWN BY: / APPROVED BY:	TITLE: FIGURE 4-4: DPDO SALVAGE YARD DISTRIBUTION OF VOC AND SVOCs IN GROUND WATER
DATE: NOV 1993	SCALE: 1"=250'	DWG. NO.: 67069033	Arthur D Little

REV #	DATE
1	10/93



NOTE: COE-1, DH-1-OW, DH-3-OW, AND DH-4-OW INSTALLED BY CORPS OF ENGINEERS.

LEGEND

MW-42 (symbol)	MONITORING WELL LOCATION
— — —	APPROXIMATE LIMIT OF DPDO SALVAGE YARD
>150	METALS EXCEEDING THE MCL IN GROUND WATER (ug/L)
--	NOT DETECTED

PREPARED FOR: USAEC			DRAWN BY:	TITLE: FIGURE 4-5: DPDO SALVAGE YARD DISTRIBUTION OF METALS EXCEEDING MCLs IN GROUND WATER
			APPROVED BY:	
DATE: NOV 1993	SCALE: 1"=250'	DWG. NO.: 67069031	Arthur D Little	

Table 4-1: Ground Water Elevation Data for the DPDO Salvage Yard and Transformer Storage Area

Site ID	MP Elevation ft MSL	Date: 2/23/93	
		DTW ft	Elevation ft MSL
COE-1	146.42	26.40	120.02
MW-42	178.26	42.15	136.11
MW-43S	171.34	35.50	135.84
MW-43D	171.72	36.10	135.62
MW-200	170.38	50.35	120.03
MW-201	151.60	31.39	119.96
DH-3-OW	157.14	35.65	121.49
DH-04-0W	200.34	62.38	137.96

Notes:
MSL - mean sea level
MP - measuring point (notched or marked PVC) unless noted otherwise
DTW - depth-to-water from the measuring point

Table 4-2 Summary of Laboratory Samples for the DPDO Salvage Yard and Transformer Storage Area - As Collected (Page 1 of 2)
Fort George G. Meade, Site Inspection Addendum

TYPE OF SAMPLE	SITE ID	FIELD ID	DATE	SITE TYPE	MEDIA CODE	N/E (1)	DEPT	TCL SVOC	TCL VOC	PHC	TAL FMET	TAL UMET	TCLP ORG/ MET	PCB	EXP	CI	NO3	TDS	SO4	PEST
SOIL INVESTIGATION																				
Background Soils	BKG-16	B1A0016	020293	AHOL	CSO	N	2-3 FT	0	0	0	0	1	0	0	0	0	0	0	0	1
	BKG-17	B1A0017	020293	AHOL	CSO	N	2-3 FT	0	0	0	0	1	0	0	0	0	0	0	0	1
	BKG-18	B1A0018	020293	AHOL	CSO	N	2-3 FT	0	0	0	0	1	0	0	0	0	0	0	0	1
	BKG-22	B1A0022	011894	AHOL	CSO	N	2-3 FT	0	0	0	0	1	0	0	0	0	0	0	0	1
	BKG-23	B1A0023	011894	AHOL	CSO	N	2-3 FT	0	0	0	0	1	0	0	0	0	0	0	0	1
Soil Samples	SS-200	D1A0200A	020293	AHOL	CSO	N	0-6 IN	0	0	0	0	0	0	1	0	0	0	0	0	0
	SS-201	D1A0201A	020293	AHOL	CSO	N	0-6 IN	0	0	0	0	0	0	1	0	0	0	0	0	0
	SS-202	D1A0202A	020293	AHOL	CSO	N	0-6 IN	0	0	0	0	0	0	1	0	0	0	0	0	0
	SS-203	D1A0203A	020393	AHOL	CSO	N	0-6 IN	0	0	0	0	0	0	1	0	0	0	0	0	0
	SS-204	D1A0204A	020393	AHOL	CSO	N	0-6 IN	0	0	0	0	0	0	1	0	0	0	0	0	0
	SS-205	D1A0205A	020393	AHOL	CSO	N	0-6 IN	0	0	0	0	0	0	1	0	0	0	0	0	0
Collocates	93QC-400 (dup of SS-200)	Q1AD400	020293	AHOL	CSO	N	0-6 IN	0	0	0	0	0	0	1	0	0	0	0	0	0
Field Blanks	93QC-103	Q1XF103	020293	FBLK	CSW	N	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Rinse Blanks	93QC-104	Q1XR203	020393	RNSW	CSW	N	0	0	0	0	0	0	0	1	0	0	0	0	0	0

Table 4-2 Summary of Laboratory Samples for the DPDO Salvage Yard and Transformer Storage Area - As Collected (Page 2 of 2)
Fort George G. Meade, Site Inspection Addendum

TYPE OF SAMPLE	SITE ID	FIELD ID	DATE	SITE TYPE	MEDIA CODE	N/E (1)	DEPT	TCL SVOC	TCL VOC	PHC	TAL FMET	TAL UMET	TCLP ORG/ MET	PCB	EXP	Cl	NO3	TDS	SO4	PEST
GROUND WATER INVESTIGATION																				
Ground Water Samples	COE-1	D1M0001	022393	WELL	CGW	E	UP	1	1	0	1	1	0	0	0	0	0	0	0	0
	MW-42	D1M0042	022493	WELL	CGW	E	UP	1	1	0	1	1	0	0	0	0	0	0	0	0
	MW-43D	D1M043D	022493	WELL	CGW	E	LP	1	1	0	1	1	0	0	0	0	0	0	0	0
	MW-43S	D1M043S	022493	WELL	CGW	E	UP	1	1	0	1	1	0	0	0	0	0	0	0	0
	DH-3-OW	D1M0003	NC	WELL	CGW	E	UP	--	--	--	--	--	--	--	--	--	--	--	--	--
	DH-4-OW	D1M0004	NC	WELL	CGW	E	UP	--	--	--	--	--	--	--	--	--	--	--	--	--
	MW-200	D1M0200	022393	WELL	CGW	N	UP	1	1	0	1	1	0	0	0	0	0	0	0	0
	MW-201	D1M0201	031893	WELL	CGW	N	UP	1	1	0	1	1	0	0	0	0	0	0	0	0
Collocates	93QC-452 (dup of MW-42)	Q1XD452	022393	WELL	CGW	E	UP	1	1	0	1	1	0	0	0	0	0	0	0	0
Field Blanks	93QC-153	Q1XF153	022393	FBLK	CSW	N	0	1	1	0	1	1	0	0	0	0	0	0	0	0
Rinse Blanks	93QC-253	X1XR253	022393	RNSW	CSW	N	0	1	1	0	1	1	0	0	0	0	0	0	0	0

NOTES:

(1) indicates if sample location is new (N) or existing (E)
IRDMIS Site Type Codes: WELL=water, AHOL=auger hole
FBLK=field blank, RNSW=rinse water
IRDMIS Media Codes: CGW=chemical ground water, CSO=chemical soil
CSW=chemical surface water
Depths for ground water samples: UP=upper Patapsco, LP=lower Patapsco,
PX=Patuxent, ND=not determined or unclear
NA - not applicable
Shading indicates changes from the original SOW

TCL, VOCs - Volatile Organics, Target Compound List
TCL, SVOCs - Semivolatile Organics, Target Compound List
PHC - Petroleum hydrocarbons
TAL FMET - Filtered metals, Target Analyte List
TAL UMET - Unfiltered metals, Target Analyte List
ORG/MET - organics/metals
EXP - Explosives
NC - not collected (explained in text)
TDS - Total Dissolved Solids
PEST - Pesticides

Table 4-3: PCBs in Surficial Soil at the DPDO Salvage Yard and Transformer Storage Area
Page 1 of 1

Sample Location Identification	SS-200	93QC-400	SS-201	SS-202	SS-203	SS-204	SS-205
Field Sample ID	D1A0200Y	Q1AD400Y	D1A0201Y	D1A0202Y	D1A0203Y	D1A0204Y	D1A0205Y
Start Depth (ft bgs)	0	0	0	0	0	0	0
End Depth (ft bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Media	CSO	CSO	CSO	CSO	CSO	CSO	CSO
Collection Date	02-Feb-93	02-Feb-93	02-Feb-93	02-Feb-93	03-Feb-93	03-Feb-93	03-Feb-93
QC Type		Dup. of SS-200					
PCBs (ug/g)							
PCB 1260	0.314	0.271	4	0.752	0.599	1.53	–
TOTAL PCBs	**0.3**	**0.3**	**4**	**0.8**	**0.6**	**2**	**0**

Notes:
Dashes indicate that the analyte is present below detection limit
Only detected analytes are included on this table, for full data set see appropriate appendix

TABLE 4-4: Field Screening and Metals Data for Ground Water from the DPDO Salvage Yard and Transformer Storage Area
Page 1 of 2

Sample Location Identification			COE-1	COE-1	MW-42	MW-42	93QC-452	93QC-452	MW-43D	MW-43D
Field Sample ID			D1M0001Y	D1M0001Z	D1M0042Y	D1M0042Z	Q1XD452Y	Q1XD452Z	D1M043DY	D1M043DZ
Site Type			WELL	WELL	WELL	WELL	WELL	WELL	WELL	WELL
Screen Start Depth (ft bgs)			24.5+	24.5+	35	35	35	35	82	82
Screen End Depth (ft bgs)			34.5+	34.5+	45	45	45	45	92	92
Media			CGW	CGW	CGW	CGW	CGW	CGW	CGW	CGW
Total/Dissovled			Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
Collection Date			23-Feb-93	23-Feb-93	24-Feb-93	24-Feb-93	24-Feb-93	24-Feb-93	24-Feb-93	24-Feb-93
QC Type							Duplicate of MW-42			
FIELD PARAMETERS										
pH			4.33		4.85				4.72	
Conductivity(umhos/cm2)			0.196		0.303				0.595	
Temperature(C)			12.7		12.1				9.8	
Turbidity(NTU)			5		0				2	
METALS (ug/L)	**MCL**	**SMCL/MCLG**								
Aluminum	--	50-200 S	2,240	136	12,300	197	26,900	191	249	--
Arsenic	50	--	--	--	4.35	--	7.78	--	--	--
Barium	2,000	-- G	94	83.4	193	104	255	101	238	216
Beryllium	4	-- G	--	--	--	--	1.2	--	--	--
Boron	--	--	--	--	457	410	500	354	--	--
Calcium	--	--	12,300	11,900	28,200	27,100	28,500	22,900	32,700	30,000
Chromium	100	-- G	--	--	254 *	98.1	344 *	91.6	--	19.1
Copper	1,300	1,000 G	21.8	--	56.5	--	97.4	--	--	--
Iron	--	300 S	9,130	286	34,800	99.9	55,800	--	203	84.4
Lead	15	--	--	--	11.7	--	15.1 *	--	--	--
Magnesium	--	--	4,040	4,090	12,100	10,900	13,100	10,100	7,690	6,920
Manganese	--	50 S	60.1	60.8	158	131	181	122	179	67.3
Mercury	2	-- G	--	--	--	--	0.126	--	--	--
Potassium	--	--	3,410	2,570	5,620	4,030	6,910	3,290	15,200	13,900
Sodium	--	--	17,600	19,400	10,100	9,850	9,890	8,460	75,000	71,000
Vanadium	--	--	--	--	65.6	--	114	--	--	--
Zinc	--	5,000 S	67.5	71.4	127	105	125	80.8	38.3	25.7
TOTAL HEAVY METALS			0	0	270	98	368	92	0	19
TOTAL METALS			48,963	38,598	104,447	53,025	142,741	45,690	131,497	122,233

NOTES:
Only detected analytes are included on this table, for full data set see the appropriate appendix
Pluses (+) indicate that the screen interval based on total depth measurements assuming a 10-foot screen and a 2.5-ft stickup (well construction information unavailable)
Asterisks (*) indicate analytes present above primary standards (e.g., MCL, maximum AWQC)
MCL - maximum contaminant level, MCLG (G) - MCL goal, SMCL (S) - secondary MCL
Dashes (--) indicate that no standard (e.g., MCL, SMCL, MCLG) exists or that the analyte is present below detection limits
Action levels for lead and copper are listed under MCLs
Heavy metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag

03-May-94,DSYMETX.WQ1CFK

TABLE 4-4: Field Screening and Metals Data for Ground Water from the DPDO Salvage Yard and Transformer Storage Area

Sample Location Identification	MCL	SMCL/MCLG	MW-43S	MW-43S	MW-200	MW-200	MW-201	MW-201
Field Sample ID			D1M043SY	D1M043SZ	D1M0200Y	D1M0200Z	D1M0201Y	D1M0201Z
Site Type			WELL	WELL	WELL	WELL	WELL	WELL
Screen Start Depth (ft bgs)			30	30	47	47	26	26
Screen End Depth (ft bgs)			40	40	57	57	36	36
Media			CGW	CGW	CGW	CGW	CGW	CGW
Total/Dissolved			Total	Dissolved	Total	Dissolved	Total	Dissolved
Collection Date			24-Feb-93	24-Feb-93	23-Feb-93	23-Feb-93	18-Mar-93	18-Mar-93
QC Type								
FIELD PARAMETERS								
pH			4.21		4.46		4.68	
Conductivity(umhos/cm2)			0.778		0.226		0.181	
Temperature(C)			11.7		11.9		12	
Turbidity(NTU)			0		2		>999	
METALS (ug/L)	**MCL**	**SMCL/MCLG**						
Aluminum	--	50-200 S	18,100	1,460	1,430	--	5,810	139
Arsenic	50	--	8.29	--	--	--	3.98	--
Barium	2,000	-- G	173	106	107	105	110	49.4
Beryllium	4	-- G	1.45	--	--	--	--	--
Boron	--	--	--	367	267	296	--	--
Calcium	--	--	26,000	25,500	19,100	25,100	12,700	12,900
Chromium	100	-- G	98.5	--	--	--	18.2	--
Copper	1,300	1,000 G	89.5	--	37.4	--	--	--
Iron	--	300 S	57,200	180	3,530	118	5,010	--
Lead	15	--	19.4 *	--	--	--	--	--
Magnesium	--	--	11,900	11,300	5,180	5,710	7,050	6,910
Manganese	--	50 S	310	290	112	104	158	134
Mercury	2	-- G	0.859	--	--	--	--	--
Potassium	--	--	5,140	3,780	5,700	6,550	4,290	3,530
Sodium	--	--	97,000	90,000	8,560	9,710	19,600	20,100
Vanadium	--	--	116	--	--	--	--	--
Zinc	--	5,000 S	298	316	39.7	41.2	286	186
TOTAL HEAVY METALS			128	0	0	0	22	0
TOTAL METALS			216,455	133,299	44,063	47,734	55,036	43,948

NOTES:

Only detected analytes are included on this table, for full data set see the appropriate appendix
Pluses (+) indicate that the screen interval based on total depth measurements assuming a 10-foot screen and a 2.5-ft stickup (well construction information unavailable)
Asterisks (*) indicate analytes present above primary standards (e.g., MCL, maximum AWQC)
MCL - maximum contaminant level, MCLG (G) - MCL goal, SMCL (S) - secondary MCL
Dashes (--) indicate that no standard (e.g., MCL, SMCL, MCLG) exists or that the analyte is present below detection limits
Action levels for lead and copper are listed under MCLs
Heavy metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag

TABLE 4-5: Organic Compounds in Ground Water from the DPDO Salvage Yard and Transformer Storage Area
Page 1 of 1

Sample Location Identification	MCL	SMCL/ MCLG	COE-1	MW-42	93OC-452	MW-43D	MW-43S	MW-200	MW-201
Field Sample ID			D1M0001	D1M0042	Q1XD452	D1M043D	D1M043S	D1M0200	D1M0201
Site Type			WELL	WELL	WELL	WELL	WELL	WELL	WELL
Screen Start Depth (ft bgs)			24.5+	35	35	82	30	47	26
Screen End Depth (ft bgs)			34.5+	45	45	92	40	57	36
Media			CGW	CGW	CGW	CGW	CGW	CGW	CGW
Collection Date			23-Feb-93	24-Feb-93	24-Feb-93	24-Feb-93	24-Feb-93	23-Feb-93	18-Mar-93
QC Type					Dup. of MW-42				
VOLATILE ORGANIC COMPOUNDS (ug/L)	**MCL**	**SMCL/ MCLG**							
HALOGENATED ORGANICS									
1,1-Dichloroethene	7	7	--	12 *	11 *	--	--	--	--
Chloroform	100	0 G	--	--	--	--	--	--	1.6
1,1,1-Trichloroethane	200	200 G	--	34	33	--	--	22	--
Carbon Tetrachloride	5	0 G	--	--	--	--	1.7	--	1.5
Tetrachloroethene	5	0 G	--	49 *	46 *	--	2.7	150 GT *	4.9
OTHER									
Trichlorofluoromethane	--	--	--	6.3	6	--	--	7.8	--
TENTATIVELY IDENTIFIED COMPOUNDS (TICs)									
Total Number of TICs			0	0	0	0	1	0	0
Total Concentration of TICs	--	--	--	--	--	--	4	--	--
TOTAL VOCs			0	101	96	0	8	180	8
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)									
Bromacil	--	--	--	--	--	--	4.4	--	8
TENTATIVELY IDENTIFIED COMPOUNDS (TICs)									
Total Number of TICs			0	0	0	0	0	0	1
Total Concentration of TICs	--	--	--	--	--	--	--	--	7
TOTAL SVOCs			0	0	0	0	4	0	15

NOTES:
Only detected analytes are included on this table, for full data set see the appropriate appendix
Pluses (+) indicate that the screen interval based on total depth measurements assuming a 10-foot screen and a 2.5-ft stickup (well construction information unavailable)
Asterisks (*) indicate analytes present above primary standards (i.e., MCLs, Maximum AWQC)
MCL - maximum contaminant level, MCLG (G) - MCL goal, SMCL (S) - secondary MCL

5.0 Physical Characterization and Contaminant Assessment of the Fire Training Area (FTA)

5.1 Introduction and Background

The FTA is located on Airfield Road, north of Tipton Airfield in the area to be excessed (Figures 1-2 and 5-1). This area was constructed in 1979 and is still in use for fire training by the Fort Meade Fire Department. The fires are set using aviation fuel or gasoline and extinguished with either water or aqueous firm forming foam (AFFF). AFFF is primarily comprised of pressurized biological proteins.

A limited SI was conducted at the FTA in 1990 (EA Engineering, Science and Technology, 1992). The results of that investigation are summarized below, however, for a detailed description of the study refer to that document.

During the SI, a soil gas survey, using 28 soil vapor points, was conducted and six subsurface soil samples were collected. The soil gas samples were collected at a depth of 3 feet due to the shallow depth to ground water and relatively low permeability of the soil at depths greater than 3 feet. The soil samples were collected between 4 to 6 feet, below the depth at which the water table was encountered.

The soil gas survey results were inconclusive because of the soil's low permeability. A soil gas sample from one location (VP-6) had 2,000 ppm total hydrocarbon and 0.01 ppm PCE. Benzene (0.037 µg/g), bis(2-ethylhexyl)phthalate (4.16 µg/g), and 2-methylnapthalene (0.13 µg/g) were reported in soil samples FT-1, FT-2, and FT-3, respectively. EA concluded that the metals concentrations were within the average range for metals expected to be measured in Anne Arundel County.

5.2 Summary of Investigation for Study Area

The objective of the SIA field investigation at the FTA was to determine if activities in this area have resulted in ground water contamination. The tasks conducted to achieve this objective included:

- Completion of a down-hole UXO surveys
- Installation of three water monitoring wells in the water table aquifer
- Collection and analysis of three ground water samples
- Collection and analysis of one sludge sample from the oil-water separator

During the field operations, several changes were made. Each of the changes was based on discussions with and approved by the USAEC geologist and/or COR:

- The monitoring well installation deviated from the Geotechnical Requirements (USATHAMA, 1987) because the water table was encountered at a shallower depth than the minimum depths described in these requirements.
- Ground water samples were analyzed for the presence of total petroleum hydrocarbons.

Three shallow monitoring wells were installed with their screened intervals intersecting the water table. The wells were placed based upon observations made during the field operations and previous site visit. The three well locations were selected to represent upgradient and downgradient locations. All of the wells were installed to evaluate the potential impact on ground water resulting from fire fighting training activities and to determine the direction of ground water flow. FTAMW-1 was installed along the southern boundary of the property and FTAMW-2 and FTAMW-3 were installed along the northern boundary of the property (Figure 5-1).

Due to the shallow water table, approval was given to deviate from Geotechnical Requirements with respect to the monitoring well installation. The Geotechnical Requirements assume that the depth to water is a minimum of 18 feet. The screened intervals for the three monitoring wells required more shallow placement to ensure that the top of the water table was intersected. It is critical that the screen be placed as such so that any floating non-aqueous phase liquid (NAPL), if present, would be detected. In all three wells the sand pack filter was 1 foot above the screened interval and the bentonite seal was 1 foot thick.

Ground water samples were collected from each well at the FTA and analyzed for VOCs, SVOCs, total petroleum hydrocarbons (TPHC), and total and dissolved metals. Approval was granted to collect additional samples for TPHC analysis based upon the historical use of this parcel and reported fuel odors during previous investigations.

5.3 Physical Characterization of the Study Area

5.3.1 General Description

The facility includes a 20-foot diameter concrete pad surrounded by a 1-foot concrete berm. Several other structures, including a small building for enclosed fire fighting, are used for fire training. There is a subsurface sump, which appears to be an oil-water separator, adjacent to the concrete fire training area. The sump presumably collects water from the training area, however, its function and connection have not been confirmed. Other objects found within the fenced area include two abandoned cars, an abandoned helicopter, a storage tank (not in use), several storage trailers, and a pile of soil covered with clear plastic. A culvert is located in the southwest corner, outside the fence. The origin of this culvert is not understood.

5.3.2 Geology

Geotechnical samples were collected from soil borings up to a total depth of 16.5 feet. The soil is poorly sorted medium-grained sand grading downward into a fine-grained sand with silt. The sand's color varied slightly with depth; there were no significant changes observed in the silt's color or texture.

The soil observed at the FTA is representative of the lower Patapsco Formation. The location of the FTA at FGGM further supports that the wells are placed in the lower Patapsco Formation.

5.3.3 Hydrogeology

The unconfined, lower Patapsco aquifer acts as the water table aquifer at the FTA. The hydrogeologic field investigation included the installation of three monitoring wells and collection of ground water samples.

A complete round of depth-to-water measurements was collected February 18, 1993. The measurements are reported along with corresponding water level elevations on Table 5-1. Ground water levels ranged from 115.76 to 116.34 feet MSL. The ground water flow is to the west, as illustrated in Figure 5-2.

The wells with maximum and minimum water levels are approximately 100 feet apart. The average ground water gradient across the site is 6×10^{-3} ft/ft. Because this is a very shallow gradient, it may be susceptible to seasonal variation, thus the direction of ground water flow cannot be concluded with accuracy.

5.4 Nature and Extent of Contamination

During the SIA field investigation ground water samples were collected to evaluate the nature and extent of contamination. The results of these sampling efforts are described below. The data tables presented in this section provide a summary of the detected analytes. A complete summary of the data for each sample can be found in Appendix I. Table 5-2 provides a complete summary of the laboratory samples collected at the FTA, including site IDs, site types, media codes, and analytical parameters. All sampling locations are illustrated on Figure 5-1.

5.4.1 Ground Water

Three ground water samples were collected and analyzed for VOCs, SVOCs, TPHCs, and total and dissolved metals.

Field Parameters: During the sampling process, field measurements were made of the ground water for pH, conductivity, temperature, and turbidity. The field parameters are indicative of the general water quality, and are found in Table 5-3.

For ground water samples from the lower Patapsco aquifer, pH ranged from 5.06 to 7.43. Conductivity ranged from 0.100 to 0.127 μmhos/cm^2. Temperature ranged from 6.3°C to 8.8°C. The range for turbidity was from 8 to greater than 999 NTUs. None of the measurements was outside the expected range; no trends were observable.

Volatile Organic Compounds: The VOCs expected to be encountered at the FTA would include primarily VOCs used in fire extinguishers and aromatics; and petroleum-related compounds from the fuel used for the practice fires. Ground water was analyzed for 41 VOCs, of which one known compound was detected -- carbon tetrachloride. Table 5-4 includes the concentration of the VOC detected along with its respective MCL.

The VOCs detected included carbon tetrachloride and unknown VOCs. Carbon tetrachloride was detected in downgradient well FTAMW-3 at 35 μg/L, which exceeds its MCL of 5 μg/L. Figure 5-3 illustrates the distributions of VOCs at this property.

The highest concentration of total unknown VOCs was 235 μg/L detected at FTAMW-3. The total VOC concentrations at FTAMW-1 and FTAMW-2 were both below the detection limits. During the 1991 SI, the highest soil gas reading indicated VOCs in the soils just upgradient of FTAMW-3.

Semivolatile Organic Compounds: SVOCs are present in the composition of many products, such as petroleum products, tar, tires, etc., which may have been used for fire fighting practice. Ground water was analyzed for 116 SVOCs but none were detected (Table 5-4).

Total Petroleum Hydrocarbons: Because gasoline and other petroleum products were used to fuel fires at the FTA, ground water samples were analyzed for TPHC, but none were detected (Table 5-3).

Metals: Metals occur naturally in nature; however, metals may be elevated in ground water due to the impact of metal debris such as the scrap automobiles and helicopters. Metals are also used in paints and pigments which may be painted on the equipment set on fire for fire fighting practice. Ground water was analyzed for 27 metals, both total and dissolved (filtered). Ten metals were not detected in ground water: antimony, boron, cadmium, molybdenum, nickel, selenium, silver, tellurium, thallium, and tin. Metals that were detected are summarized on Table 5-3 along with their associated MCLs. Figure 5-4 illustrates the location of metals that exceed their MCL or action level.

Metals were detected at each sampling location. Antimony and lead exceeded their MCL or action level at one location (FTAMW-3) for total metals. At each monitoring

well, the secondary MCLs (SMCL) for aluminum, iron, and manganese were exceeded in the total metals concentrations. At FTAMW-1 and FTAMW-3, the SMCL for manganese was exceeded in the dissolved metals sample. No other MCL or SMCL exceedences were reported for either total or dissolved metals; however, it should be noted that the MCLs for three metals (antimony, cadmium, and thallium) are lower than the method detection limit, thus some of the non-detect results may exceed the regulatory standards. All of the MCL exceedences for metals were reported in total metals, not dissolved metals.

Due to the natural presence of metals in ground water, it is often difficult to determine if detected metal concentrations are elevated due to site activities or represent background levels. The distribution of metals at the FTA (highest concentrations in the downgradient well) indicate that the FTA may be a source of metals contamination.

5.4.2 Sludge Sample

Volatile Organic Compounds: The sludge sample was analyzed for 41 VOCs of which five aromatic compounds were detected: benzene, dichlorobenzene, ethylbenzene, toluene, and xylenes. The compounds are indicative of petroleum products which were probably used as fuel for the fires. The highest single concentration was 9.1 μg/g of total xylenes. Three unknown VOCs were detected with a total concentration of 9.8 μg/g. Table 5-5 includes the concentrations of the detected VOCs and SVOCs.

Semivolatile Organic Compounds: The sludge sample was analyzed for 116 SVOCs of which 11 known and 10 tentatively identified compounds (TICs). The TICs were identified as petroleum related compounds (Table 5-5). The total concentration of SVOCs is 440 μg/g.

Metals: The sludge sample was analyzed for 27 metals but none were detected.

Total Petroleum Hydrocarbons: TPHCs were detected at 86,000 μg/g in the sludge sample (Table 5-5).

5.5 Contaminant Assessment

VOC and metal contamination exceeding regulatory standards was detected in the ground water at FTAMW-3, which is located in the northwest corner of the property, downgradient of the source area. Although total and dissolved metals were detected at each of the sampling locations, metals concentrations were highest at the downgradient well (FTAMW-3). The extent of contaminant migration to the west and

southwest of the site have not been evaluated. It is likely that ground water flowing westward discharges into the Little Patuxent River located to the west of the FTA.

The primary implications of this assessment are:

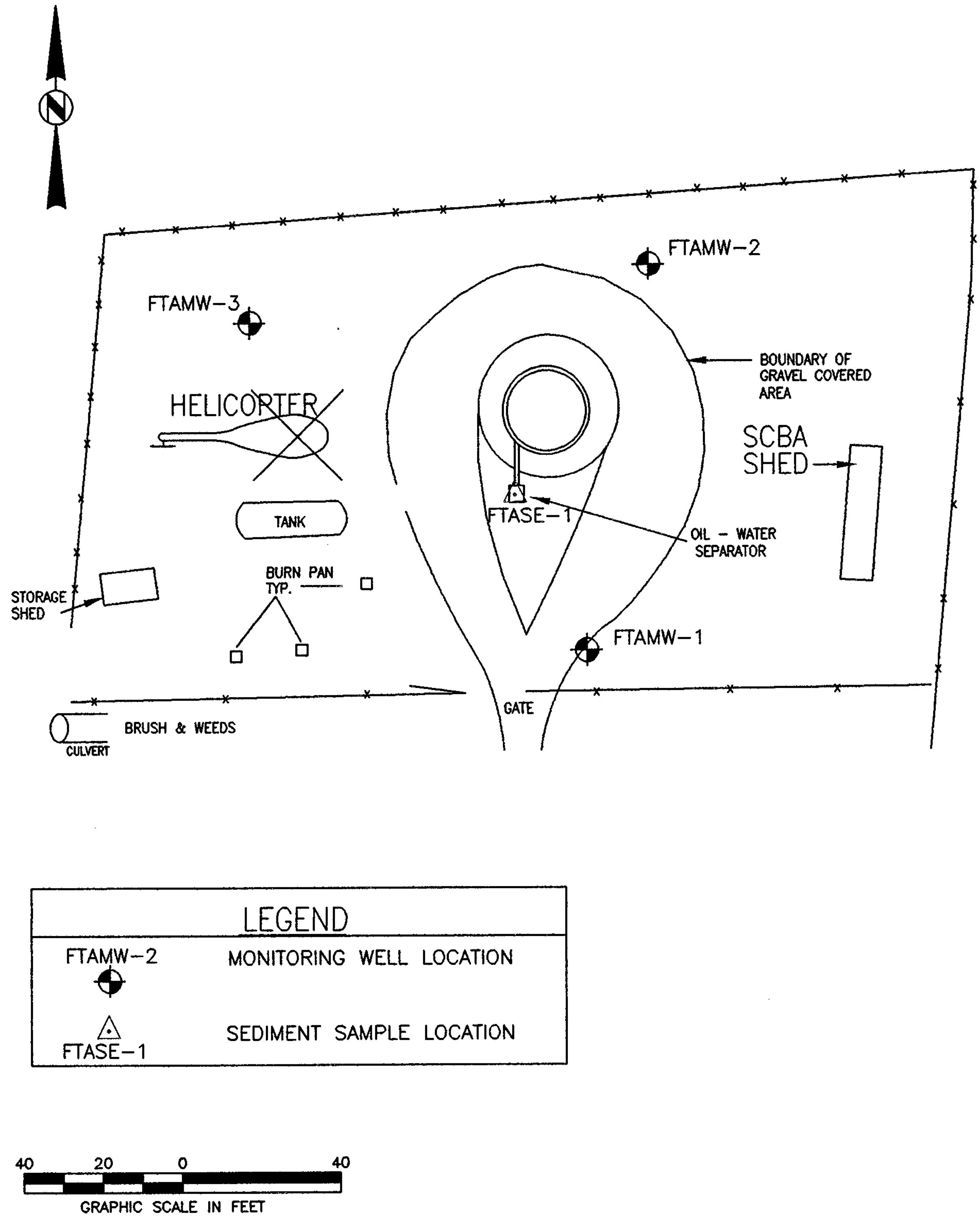
- It is likely that fire fighting activities, both recent and past, have impacted ground water quality, resulting in downgradient contamination of ground water by carbon tetrachloride.
- The extent of ground water contamination is not known to the west or southwest of the site.
- The primary direction of ground water flow may be variable due to a shallow gradient.
- The presence of TPHC and aromatic VOCs in the sludge sample, and their absence in the ground water sample, indicates that the oil-water separator is not impacting ground water in the vicinity of the wells. This may be either because the separator is not a source area, or because none of the wells are located directly downgradient of it. During the background soil sampling, one sample was collected downgradient of this area and was observed to have a sheen. This may indicate that TPHC are affecting ground water but have not migrated sufficiently northward to be detected in the monitoring wells.
- Due to the well placement, ground water downgradient of several additional potential sources, such as the smoke house and the burn pans, was not intercepted, therefore, the ground water quality may not be representative of the entire source area.

5.6 Data Gaps and Recommendations

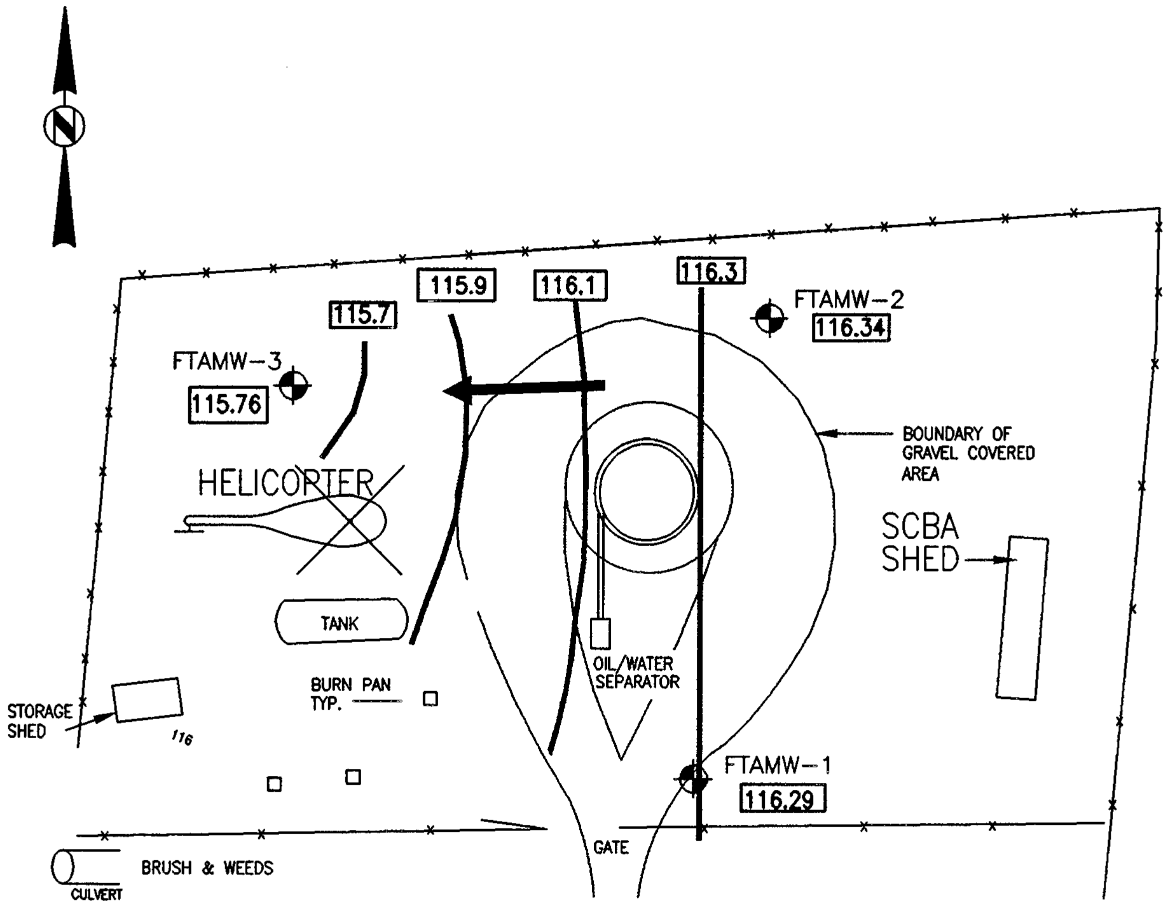
The primary objective of the SIA at the FTA was to evaluate the ground water quality, determine the direction of ground water flow and evaluate the environmental impacts sustained from human activities that could influence this site's ability to be considered part of the BRAC parcel. The direction of ground water could not be determined with certainty due to a small hydraulic gradient. Some VOC contamination also was detected in ground water downgradient of the burn area. Due to the insufficient data to determine the flow direction, it is possible that contamination is transported in other directions. There are other potential sources where contamination may originate, including the burn pans and smoke house, that may not be intercepted by the downgradient well. The following data gaps and proposed actions were identified to provide a more complete understanding of the contamination present at the FTA. The USAEC is conducting a RI at the FTA which will include a detailed evaluation of site conditions. Workplans for that effort are expected to be released in May 1995 and detail the sampling and analysis program for the site.

Data Gap	Proposed Action	Rationale
1. There are insufficient data to determine if the flow direction is consistent.	• Collect water level measurements on a quarterly basis for at least one year.	• The consistency of the water level data will indicate if the flow direction changes.
2. The extent of the carbon tetrachloride contamination is not known either down or cross-gradient.	• Collect shallow ground water samples downgradient and cross-gradient of the potential source area and screen for VOCs using a portable field GC.	• The data will be used to place the new wells; field screening allows for better placement of the wells and limits the total number of wells necessary.
3. There is no well located downgradient of some potential source areas (e.g., burn pans, smoke house).	• Install two wells downgradient of the additional source areas; locations to be chosen based on the field screening data.	• Data will be used to evaluate if other source areas have resulted in ground water contamination.
4. The extent of carbon tetrachloride contamination downgradient from FTAMW-3 is unknown.	• Install one well downgradient from FTAMW-3; location based on field screening results.	• The data will be used to evaluate the furthest extent of carbon tetrachloride contamination.
5. The carbon tetrachloride contamination has not been confirmed.	• Collect ground water samples from the three existing and three new wells. • Analyze samples from new wells for TAL inorganic, TCL VOCs and SVOCs, and TPHCs; analyze samples from existing wells for VOCs.	• Data from the existing wells are necessary to confirm the previous results; data are needed from both the new and existing wells to define the extents of the carbon tetrachloride detection.
6. No data exists regarding upgradient metal concentrations	• Install one upgradient well. • Analyze samples for VOCs and total and filtered metals.	• Data will be used to establish background metal concentrations; the VOC analysis is included to ensure that the location has not been impacted by site contaminants.
7. A culvert exists in southwest corner of the fenced area and may be a discharge point from ground water from the site.	• Collect one discharge water sample. • Collect one sediment sample from the soil directly underneath the discharge point • Analyze both samples for TCL VOCs and SVOCs, TAL, and TPHC.	• The data are important for understanding the potential impact the culvert and surface discharge may have on the site or immediately west of the site.
8. UXO may be present in the subsurface.	• Conduct UXO clearance for all new sampling locations.	• UXO present a safety concern that requires both downhole and surface clearances.
9. Hydraulic conductivity is unknown.	• Conduct hydraulic conductivity tests in a maximum of four wells.	• Hydraulic conductivity data are necessary for determining ground water flow velocities and contaminant travel times.

Data Gap	Proposed Action	Rationale
10. Location/elevation data are needed for interpretation of hydrologic conditions.	• Survey in the new wells.	• Location data are needed for data entry into IRDMIS. • Elevation data are needed for construction of ground water contour maps.
11. A Record of Decision (ROD) may be needed for site completion.	• Conduct ecological and human health risk assessments (additional surficial soil samples may be required to complete the risk assessments). • Complete a feasibility study and proposed plan.	• Additional tasks are required for a ROD.



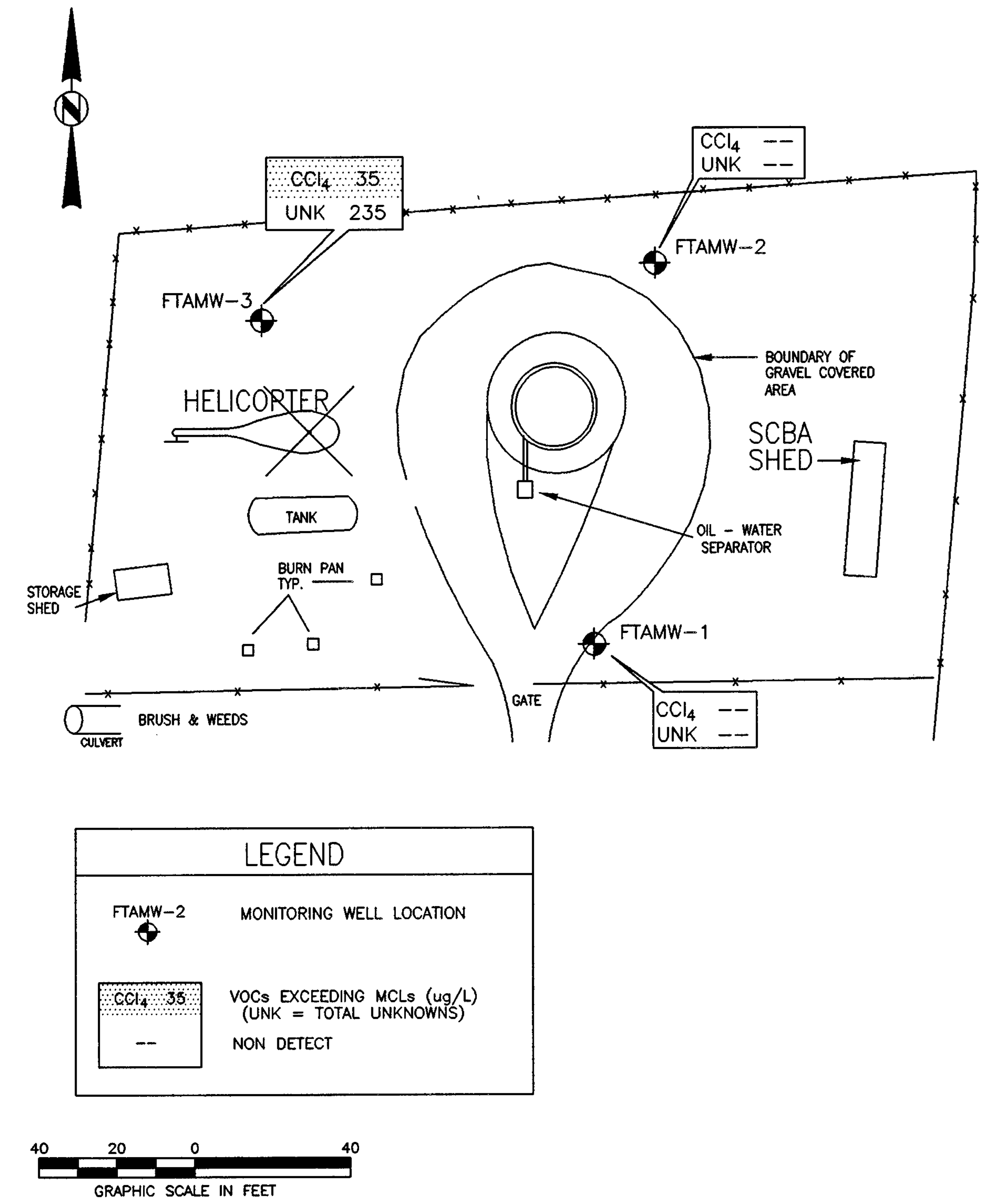
PREPARED FOR: USAEC		SOURCE: USATHAMA, 1992	TITLE: FIGURE 5-1: FIRE TRAINING AREA SITE LAYOUT AND SAMPLING LOCATIONS
DATE: NOV 1993	SCALE: 1"=40'	DWG. NO.: 67069022	Arthur D Little



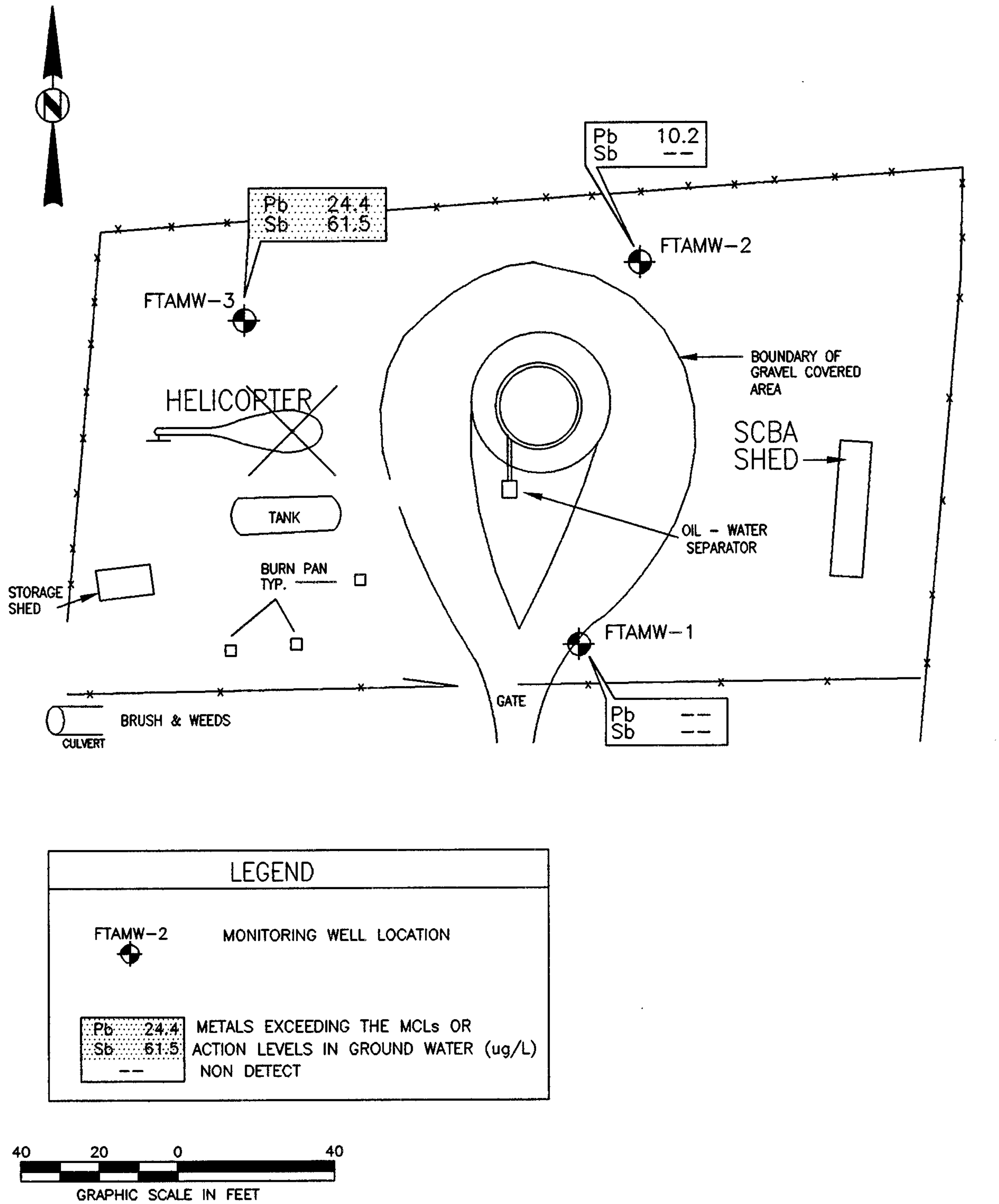
LEGEND	
116.29 FTAMW-2	MONITORING WELL LOCATION
116.2	WATER ELEVATION CONTOUR (ft AMSL)
➞	DIRECTION OF GROUND WATER FLOW

40 20 0 40
GRAPHIC SCALE IN FEET

PREPARED FOR: USAEC			SOURCE: USATHAMA, 1992	TITLE: FIGURE 5-2: FIRE TRAINING AREA GROUND WATER CONTOUR MAP
DATE: NOV 1993	SCALE: 1"=40'	DWG. NO.: 67069021	Arthur D Little	



PREPARED FOR: USAEC			SOURCE: USAEC, 1992	TITLE: FIGURE 5-3: FIRE TRAINING AREA DISTRIBUTION OF VOCs IN GROUND WATER
DATE: NOV 1993	SCALE: 1"=40'	DWG. NO.: 67069023	Arthur D Little	



PREPARED FOR: USAEC			SOURCE: USAEC, 1992	TITLE: FIGURE 5-4: FIRE TRAINING AREA DISTRIBUTION OF METALS EXCEEDING MCLs IN GROUND WATER
DATE: NOV 1993	SCALE: 1"=40'	DWG. NO.: 67069024	Arthur D Little	

Table 5-1: Ground Water Elevation Data

Site ID	Ground Elevation ft MSL	MP Elevation ft MSL	Date: 2/18/93	
			DTW ft	Elevation ft MSL
FTAMW-1	118.36	120.71	4.42	116.29
FTAMW-2	119.49	121.88	5.54	116.34
FTAMW-3	117.86	120.37	4.70	115.67

Notes:
MSL - mean sea level
MP - measuring point (notched or marked PVC) unless noted otherwise
DTW - depth-to-water from the measuring point

Table 5-2 Summary of Laboratory Samples for the Fire Training Area - As Collected
Fort George G. Meade, Site Inspection Addendum

TYPE OF SAMPLE	SITE ID	FIELD ID	DATE	SITE TYPE	MEDIA CODE	N/E (1)	DEPTH	TCL SVOCs	TCL VOC	PHC	TAL FMET	TAL UMET	TCLP ORG/ MET	PCB	EXP	CI	NO3	TDS	SO4	PEST
SOIL INVESTIGATION																				
Background Soils	BKG-13	B1A0013	012893	AHOL	CSO	N	2-3 FT	0	0	0	0	1	0	0	0	0	0	0	0	1
	BKG-14	B1A0014	012893	AHOL	CSO	N	2-3 FT	0	0	0	0	1	0	0	0	0	0	0	0	1
SOURCE INVESTIGATION																				
Sludge Sample	FTASE-1	F1D0001	011894	SUMP	CSE	N	0-6 IN	1	1	1	0	0	0	0	0	0	0	0	0	0
GROUND WATER INVESTIGATION																				
Ground Water Samples	FTAMW-1	F1M0001	021893	WELL	CGW	N	ND	1	1	1	1	1	0	0	0	0	0	0	0	0
	FTAMW-2	F1M0002	021893	WELL	CGW	N	ND	1	1	1	1	1	0	0	0	0	0	0	0	0
	FTAMW-3	F1M0003	021893	WELL	CGW	N	ND	1	1	1	1	1	0	0	0	0	0	0	0	0
Field Blanks	93QC-15	Q1XF152	021893	FBLK	CSW	N	NA	1	1	1	1	1	0	0	0	0	0	0	0	0
Rinse Blanks	93QC-25	Q1XR252	021893	RNSW	CSW	N	NA	1	1	1	1	1	0	0	0	0	0	0	0	0

NOTES:

(1) indicates if sample location is new (N) or existing (E)

IRDMIS Site Type Codes: WELL=water, AHOL=auger hole
FBLK=field blank, RNSW=rinse water

IRDMIS Media Codes: CGW=chemical ground water, CSO=chemical soil
CSW=chemical surface water

Depths for ground water samples: UP=upper Patapsco, LP=lower Patapsco,
PX=Patuxent, ND=not determined or unclear

NA - not applicable

Shading indicates changes from the original SOW

TCL, VOCs - Volatile Organics, Target Compound List
TCL, SVOCs - Semivolatile Organics, Target Compound List
PHC - Petroleum hydrocarbons
TAL FMET - Filtered metals, Target Analyte List
TAL UMET - Unfiltered metals, Target Analyte List
ORG/MET - organics/metals
EXP - Explosives

Table 5-3: Field Screening, Metals and Petroleum Hydrocarbon Data for Ground Water from the Fire Training Area

Sample Location Identification	MCL	SMCL/MCLG	FTAMW-1	FTAMW-1	FTAMW-2	FTAMW-2	FTAMW-3	FTAMW-3
Field Sample ID			F1M0001Y	F1M0001Z	F1M0002Y	F1M0002Z	F1M0003Y	F1M0003Z
Site Type			WELL	WELL	WELL	WELL	WELL	WELL
Screen Start Depth (ft bgs)			3.5	3.5	3.6	3.6	3.8	3.8
Screen End Depth (ft bgs)			13.5	13.5	13.6	13.6	13.8	13.8
Media			CGW	CGW	CGW	CGW	CGW	CGW
Total/Dissolved			Total	Dissolved	Total	Dissolved	Total	Dissolved
Collection Date			18-Feb-93	18-Feb-93	18-Feb-93	18-Feb-93	18-Feb-93	18-Feb-93
QC Type								
FIELD PARAMETERS								
pH			7.43		5.59		5.06	
Conductivity (umhos/cm2)			0.127		0.1		0.111	
Temperature (C)			7.3		8.8		6.3	
Turbidity (NTU)			8		140		>999	
METALS (ug/L)	**MCL**	**SMCL/MCLG**						
Aluminum	–	50-200 S	1,320	–	7,460	–	23,700	–
Antimony	6	– G	–	–	–	–	61.5 *	–
Arsenic	50	–	–	–	–	–	5.82	–
Barium	2,000	– G	44.5	24.6	65.6	18.7	178	46.9
Beryllium	4	– G	–	–	–	–	2.35	–
Calcium	–	–	14,200	13,800	14,600	12,400	14,100	12,800
Chromium	100	–	–	–	23.1	–	57.9	–
Cobalt	–	–	–	–	–	28.8	37	31.9
Copper	1,300	1,000 G	–	–	–	–	31.3	–
Iron	–	300 S	2,820	–	15,200	–	44,400	115
Lead	15	–	–	–	10.2	–	24.4 *	–
Magnesium	–	–	4,290	3,750	3,810	1,960	8,060	3,460
Manganese	–	50 S	94.7	67.5	155	35.9	637	327
Mercury	2	– G	–	–	–	–	0.1	–
Potassium	–	–	1,740	1,780	3,570	2,740	5,130	1,710
Sodium	–	–	2,380	2,320	3,150	2,820	2,920	2,980
Vanadium	–	–	–	–	–	–	101	–
Zinc	–	5,000 S	–	–	34.8	–	76.2	–
HEAVY METALS			0	0	33	0	90	0
TOTAL METALS			26,889	21,742	48,079	20,003	99,523	21,471
TOTAL PETROLEUM HYDROCARBONS			ND	NA	ND	NA	ND	NA

NOTES:
Only detected analytes are included on this table, for full data set see the appropriate appendix
Asterisks (*) indicate analytes present above primary standards (e.g., MCL, maximum AWQC)~
MCL - maximum contaminant level, MCLG (G) - MCL goal, SMCL (S) - secondary MCL
Dashes (–) indicate that no standard (e.g., MCL, SMCL, MCLG) exists or that the analyte is present below detection limits
Action levels for lead and copper are listed under MCLs
Heavy metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag
NA-not analyzed; ND-no analytes detected in this class

Table 5-4: Organic Compounds in Ground Water from the Fire Training Area

Sample Location Identification Field Sample ID Site Type Screen Start Depth (ft bags) Screen End Depth (ft bags) Media Collection Date QC Type			FTAMW-1 F1M0001Y WELL 3.5 13.5 CGW 18-Feb-93	FTAMW-2 F1M0002Y WELL 3.6 13.6 CGW 18-Feb-93	FTAMW-3 F1M0003Y WELL 3.6 13.6 CGW 18-Feb-93
VOLATILE ORGANIC COMPOUNDS (ug/L)					
HALOGENATED ORGANICS	MCL	SMCL/MCLG			
Carbon Tetrachloride	5	– G	–	–	35 *
TENTATIVELY IDENTIFIED COMPOUNDS (TICs)					
Total Number of TICs			0	0	1
Total Concentration of TICs	–	–	–	–	235
Total VOC			0	0	270
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)			ND	ND	ND

NOTES:
MCLs = maximum contaminant levels; S = secondary MCLs (SMCLs); G = MCL goals (MCLG)
Asterisks (*) indicate analytes present above primary standards (e.g., MCL, maximum AWQC)~
Dashes indicate that no standard exists (e.g. MCL or SMCL/MCLG) or that the analyte is present below detection limits
Only detected analytes are included on this table, for full data set see appropriate appendix
ND indicates that no analytes were detected in this class

TABLE 5-5: Organic Compounds In Sediment from the Fire Training Area
Page 1 of 1

Site ID	FTASE-1
Field Sample ID	F1D0001A
Site Type	SUMP
Start Depth (ft)	0
End Depth (ft)	0.5
Media	CSE
Collection Date	18-Jan-94
QC Type	
VOLATILE ORGANIC COMPOUNDS (ug/g)	
AROMATICS	
Benzene	0.57
Toluene	4.7
Ethylbenzene	1.4
m-Xylene	4.3
Xylenes	4.8
CHLORINATED AROMATICS	
Dichlorobenzene, nonspecific	1.6
TENTATIVELY IDENTIFIED COMPOUNDS (TICs)	
Total number of TICs	3
Total Concentration of TICs	9.8
TOTAL VOCS	27.2
SEMIVOLATILE ORGANIC COMPOUNDS (ug/g)	
CHLORINATED MONOCYCLIC AROMATICS	
1,2-Dichlorobenzene	11
NITROSAMINES	
N-Nitroso diphenylamine	60
PHTHALATES	
Bis (2-Ethyl hexyl) Phthalate	7.8
POLYNUCLEAR AROMATICS	
Naphthalene	30
2-Methylnaphthalene	70
Fluorene	27
Phenanthrene	60
Anthracene	23
Fluoranthrene	2.2
Pyrene	6.8
Chrysene	2.7
TENTATIVELY IDENTIFIED COMPOUNDS (TICs)	
Total number of TICs	3
Total Concentration of TICs	129
TOTAL SVOC	430
TOTAL PETROLEUM HYDROCARBONS (ug/g)	86,000

6.0 Physical Characterization and Contaminant Assessment of the Helicopter Hangar Area (HHA)

6.1 Introduction and Background

The HHA is located immediately west of the Tipton Airfield (Figures 1-2 and 6-1). The HHA consists of a helicopter hangar and two parking areas, one to the north (automobile) and one to the south (helicopter) of the hangar. The HHA is used primarily for servicing and storing helicopters. Materials used to service aircraft such as JP-4, hydraulic and lubricating oils, detergents, and solvents (MEK, toluene, naphtha, isopropyl alcohol) are stored on the premises.

North of the parking lot is the deluge pumping station. Former fuel storage tanks located outside of this station resulted in petroleum contaminated soil and ground water in this area. The tanks and contaminated soil were removed in January 1990 and five monitoring wells were installed. Free product, probably from the former tanks, was detected above the ground water. As a result of this discovery, a recovery system was installed in MW-1 in September 1990. In December 1990, MW-1 was discovered to be dry and a second, deeper recovery well was installed (MW-6). Another storage tank, containing No. 2 fuel oil, was also located near the parking lot's northwest corner.

During Arthur D. Little's site visit, the two discharges into the Little Patuxent River were observed. The more northerly outfall is reportedly connected to the building and serves as a drain for stormwater runoff. The southern outfall discharges water from the facility's oil-water separator. An odor was observed near the southern outfall during the site visit. The oil-water separator, located off the helicopter hangar's southwest corner, collects runoff from the helicopter pads, wash rack, oil storage areas, and drains inside the hangar.

A soil gas survey conducted as part of the overall FGGM SI (EA Engineering, Science and Technology, 1992b) located areas of elevated VOCs (up to 3,000 ppm total VOCs). The highest concentrations were from points on or adjacent to the parking lot.

6.2 Summary of Investigation for Study Area

6.2.1 Proposed Scope of Work

The objective of the SIA field investigation at the HHA was to determine if activities in this area, such as use of oil storage tanks and oil-water separators, and river discharges, have impacted soil, ground water, or the Little Patuxent River. The tasks conducted to achieve these objectives included:

- Installation of one monitoring well in the area of the highest soil gas concentration
- Collection of ground water samples from the new and existing wells
- Completion of location and elevation surveys of the new and existing wells
- Collection of eight soil samples (four for analysis) from the oil-water separator area
- Collection of five surface water and five sediment samples from the Little Patuxent River. The river samples were from upstream, adjacent to, and downstream of the HHA.

The site layout and sampling locations are illustrated on Figure 6-1.

6.2.2 Approved Deviations

The samples were collected as proposed with the following changes.

- No sediment sample could be collected at one location, HHASE-5, because no sediment was present.

- The soil samples associated with the oil-water separator were not collected because the base of the separator was too deep for appropriate samples to be collected using a hand auger. Access was also limited due to frozen ground and building activities.

- Due to odors and visible sheens from four of the wells at the HHA, the purge water was drummed instead of being released to the ground surface.

6.3 Physical Characterization of the Study Area

6.3.1 General Description

The HHA is bordered to the west by the little Patuxent River and to the north by a small tributary to the river. Three buildings are located in this area: the deluge pumping station (Building 91), the helicopter hangar (Building 90) and a storage shed located west of the hangar. Paved parking areas are located north (cars) and south (helicopters) of the hangar. The HHA is surrounded by a fence that is secured from both the river and the road. The area outside the fence and along the river is wooded. The banks of the river are generally steep.

The small tributary located north of the HHA is approximately 6 feet wide and drains the area north and west of the HHA. Silty water with a sheen was observed in the tributary during the January 1994 sampling event.

The Little Patuxent River is approximately 30 feet wide. Upstream of the HHA, the waste water treatment plant discharges water with noticeable foam. The northern outfall at the HHA is a small channel (less than 6-inches wide); it was unclear if any

water was being discharged from this outfall at the time of sampling. The southern outfall at the HHA is from the oil/water separator and consists of an approximately 4-foot diameter steel pipe and was visibly discharging at the time of sampling. The river depth at the southern outfall limited collection of a direct discharge sample.

6.3.2 Geology

One well (HHA-6) was installed during the SIA. The soil at that location was representative of fill material. It was generally sand with some gravel. Although little data are available regarding geology, the position of the HHA relative to the IL2 suggests that the uppermost geological formation at the HHA is likely to be the lower Patapsco formation. Soil boring and well construction information for some of the HHA wells provided by EMO, is included in Appendix C.

6.3.3 Hydrogeology

The unconfined aquifer at the HHA is probably the lower Patapsco aquifer. All of the shallow wells are screened in this aquifer. The existing wells were installed and are regularly sampled by the Environmental Management Office (EMO). These wells are referred to in this report and in IRDMIS as HHAME-1 through HHAME-6 to indicate that they are wells from the HHA but associated with the EMO. Wells HHAME-1, HHAME-4 and HHA-6 are installed so that the screened interval intersects the water table which ensures that any floating petroleum product is encountered. It is unknown if the remaining wells intersect the water table because no information was available regarding their construction.

A complete round of depth-to-water measurements was conducted on January 20, 1994. The measurements and their corresponding water level elevations are reported on Table 6-1. Depth to ground water ranged from 4.0 to 8.17 feet below ground surface with a corresponding range in elevations from 97.43 to 101.64 feet MSL. The steepest hydraulic gradient, 0.036 feet/feet, is found between HHA-6 and HHAME-5. As illustrated on Figure 6-2, the ground water generally flows northwest with components flowing more directly north and west.

6.4 Nature and Extent of Contamination

During the SIA field investigation, soil, ground water, surface water and sediment samples were collected to evaluate the nature and extent of contamination. The results of these sampling activities are described below. The data tables presented in this section provide a summary of the samples in which contamination was found. A complete summary of the data for each sample can be found in Appendix J. Table 6-2 summarizes the laboratory samples collected from the HHA including site IDs, site types, media codes, and analytical parameters. Sample locations are illustrated on Figure 6-1.

6.4.1 Soil

One soil sample was collected during the drilling of HHA-6 and analyzed for VOCs and TPHC. The sample was collected from 10 to 12 feet below grade and selected for laboratory analysis because an odor was observed. However, no VOCs or TPHC were detected in the soil sample.

6.4.2 Ground Water

Six ground water samples were collected and analyzed for VOCs, SVOCs, TPHCs and total and dissolved metals.

Field Screening Readings: During the sampling process, field measurements were made of the ground water for pH, conductivity, temperature and turbidity. The field parameters are indicative of general water quality and are included in Table 6-3 along with the metals data. For surface water, pH ranged from 6.04 to 6.71. Conductivity ranged from 0.094 to 0.444 μmhos/cm^2. Temperature ranged from 4.8°C to 11.6°C. Turbidity ranged from 6 to >999 NTUs. In general, the field screening readings are within the normal range. The low temperature measured for HHAME-1 was because there was a slight lag period between sampling and the field parameter measurements during which the sample was allowed to remain outside. This is not expected to affect the other readings appreciably.

Several observations were made during the purging and sampling which indicate the presence of contaminants:

- Water from HHAME-1 had a strong odor and a visible sheen. The color was black throughout the purging period.
- Water from HHAME-2 had a noticeable odor. The color was initially black but became clear with purging.
- Water from HHAME-3 had a strong odor and a visible sheen. The color was initially black but became clear with purging.
- Water from HHAME-4 had no noticeable odor and was clear throughout purging.
- Water from HHAME-5 had a noticeable odor and a sheen. The color was orange-brown throughout purging.
- Water from HHA-6 had an odor and a sheen. The color was clear throughout purging.

Volatile Organic Compounds: Petroleum products, depending upon their composition, contain VOCs such as benzene, toluene, ethylbenzene and xylenes. The six ground water samples were analyzed for 41 VOCs. Although no VOCs of known compounds were detected, nine tentatively identified compounds (TICs) were detected (Table 6-4). The TICs were identified as hydrocarbon related compounds.

The highest concentrations of TICs were detected in wells HHA-6 and HHAME-1. All volatiles analyzed during this project are listed in Table HHA-1 in Appendix J. This list includes all volatiles on the TCL, plus the following analytes: 1,3-dichlorobenzene, dichlorobenzene, 1,3-dichloropropane, (2-chloroethoxy)ethene, acrylonitrile, trichlorofluoromethane, and vinyl acetate. Carbazole is a semivolatile compound on the TCL that was not included in the analyses during this project. However, this compound was not identified as a TIC during this project. Figure 6-3 illustrates the distribution of contaminants at the HHA.

Semivolatile Organic Compounds: The storage of oils and other materials at the HHA may have resulted in the release of SVOCs into ground water. The six ground water samples were analyzed for 116 SVOCs, of which 3 were detected (Table 6-4). Bis(2-ethylhexyl)phthalate and endrin were detected in one location each (HHAME-4 and HHAME-1, respectively) and 2-methylnaphthalene was detected in two locations (HHAME-1 and HHAME-3). Phthalates are common laboratory contaminants, and it is possible that the phthalate is not representative of ground water chemistry. Endrin was only detected in one location, but above the MCL. The 2-methylnapthalene is a polynuclear aromatic compound which is indicative of contamination by diesel or heating fuel.

Thirty-two SVOC TICs were detected during analysis. These TICs are also related to hydrocarbon contamination. The highest concentrations of SVOC TICs were detected in HHAME-1 (1,690 μg/L) and HHAME-3 (258 μg/L).

Total Petroleum Hydrocarbons: The six ground water samples were analyzed for TPHC. Samples from two of the wells contained detectable TPHCs, 25,000 μg/L in HHAME-1 and 3,700 μg/L in HHAME-3 (Table 6-4). The locations with detectable TPHCs correspond to the samples in which strong odors were observed. A dilution factor of 10 was used for the TPHC analysis for HHAME-1. All other samples did not require a dilution.

Metals: Metals are naturally occurring elements and are commonly found in ground water. The six ground water samples were analyzed for 27 metals, of which 21 were detected: aluminum, arsenic, barium, beryllium, calcium, cadmium, cobalt, chromium, copper, iron, mercury, potassium, manganese, magnesium, sodium, nickel, lead, tin, selenium, vanadium, and zinc. The detected metals are summarized on Table 6-3.

To evaluate which metals are present at elevated concentrations, the metals are compared against MCLs. Primary MCLs or action levels are exceed for antimony (1 location), arsenic (1 location), cadmium (2 locations), chromium (2 location), and lead (3 locations). With the exception of lead in HHA-6 and chromium in HHAME-2, all of the samples in which metals exceed MCLs are from either HHAME-4 or HHAME-5. The distributions of four metals which exceeded MCLs are illustrated on Figure 6-3.

The highest concentrations of metals in ground water were detected in the central and eastern end of the northern parking lot in wells HHAME-4 and HHAME-5. Total heavy metals (a summation of the concentrations of antimony, arsenic, beryllium, cadmium, chromium, lead, nickel, selenium, and silver) was calculated as parameters for comparison between the wells. The concentration of heavy metals ranged from 14 μg/L in HHAME-3 to 599 μg/L in HHAME-4 (based on unfiltered samples). The distribution of total heavy metals is also illustrated on Figure 6-3.

Comparison of the metals data with the organic data indicates that the ground water is probably impacted by multiple sources. The tanks near the Deluge Pumping Station are the most likely source for the contamination of TPHCs in adjacent wells HHAME-1 and HHAME-3. The metals contamination is primarily under the parking lot. Possible sources of metals contamination include maintenance activities, such as degreasing or painting, or the fill that was used for construction. The metals suite is suggestive of a paint source.

The Hanger 90 Area is another possible source area; it was the location of an old fire training area, and includes an abandoned (to be removed) acid neutralization pit.

6.4.3 Surface Water and Sediment

Five surface water and four sediment samples (plus one sediment duplicate sample) were collected and analyzed for VOCs, SVOCs, TPHC and total metals.

Field Screening Readings: During the sampling process, field measurements were made of the surface water for pH, conductivity, temperature and turbidity. The field parameters are indicative of general water quality and are included in Table 6-5. For surface water, pH ranged from 6.78 to 7.04. Conductivity ranged from 0.590 to 1.29 μmhos/cm^2. Temperature ranged from 0.2°C to 1.2°C. Turbidity ranged from 31 to 128 NTUs. None of the measurements were outside of the expected range; no trends were observed.

Volatile Organic Compounds: The VOCs expected to be encountered in the river include those related to petroleum products, materials used for helicopter maintenance, and materials stored in the storage shed. The samples were analyzed for 41 VOCs but none were detected in either surface water or sediment.

Semivolatile Organic Compounds: SVOCs are also present in the composition of petroleum products. The surface water and sediment samples were analyzed for 116 SVOCs. No SVOCs were detected in surface water. Two SVOCs were detected in sediment (Table 6-6). Di-n-butyl phthalate was detected in sediment at HHASE-1 and fluoranthene was detected in sediment samples HHASE-1 and HHASE-4. Additionally, SVOCs TICs were detected in all four sediment samples with total concentrations between 3.9 and 10.4 μg/g. The highest concentration of SVOCs was detected at the upstream location.

Total Petroleum Hydrocarbons: No TPHCs were detected in either the surface water or the sediment samples (Table 6-6).

Metals: Metals are naturally occurring elements and are commonly found in surface water and sediment. The samples were analyzed for 27 metals, of which 9 were detected in surface water and 16 were detected in sediment. The detected metals are summarized on Tables 6-5 and 6-7. Total metals and total heavy metals are tabulated for a relative comparison between the samples.

One of the metals detected in surface water, zinc, has an ambient water quality criteria (AWQC), but all of the detected concentrations were below the maximum and continuous AWQC concentrations. Total metals ranged from approximately 140,000 to 240,000 μg/L, of which sodium was the primary contributor. The sodium is most likely due to use of road salt in the winter. No heavy metals were detected in the surface water.

Total metal concentrations in sediment ranged from approximately 4,000 to 43,000 μg/g and total heavy metals ranged from 5 to 52 μg/g. The upstream sample, HHASE-1, had the highest concentration of both heavy metals and total metals.

To help evaluate if the sediment concentrations are elevated, they were compared against the National Oceanographic and Atmospheric Administration (NOAA) Sediment Guidelines. The guidelines are protective of both freshwater and marine benthic organisms. NOAA guidelines that have been developed include values referred to as an effects range-low (ER-L) and an effects range-median (ER-M). The ER-L is the concentration at which 10 percent of the bioassay test species exhibited an effect, while the ER-M is the concentration at which 50 percent of the test organisms exhibited an effect. The ER-L and ER-M are included along with the sediment data on Table 6-7. All of the metals in the sediment samples fall below the ER-L, indicating that they are not present at concentrations that are impacting aquatic life. Surface water and sediment chemistry are illustrated on Figure 6-4.

To further evaluate if the detected analytes in sediment were present at elevated concentrations, but not to determine if regulatory limits had been exceeded, we have compared the maximum sediment data collected at the HHA against three different sediment criteria: NOAA, Ontario Ministry of the Environment, and Washington State Department of Ecology (WDOE) (Table 6-8). No detected concentrations exceeded either the NOAA or the WDOE criteria. The maximum concentration of barium was present above the Ontario Severe Effect concentration. Other detected barium concentrations were between the lowest effect and the severe effect. All other metals were within the Ontario criteria. In general, there were no significant differences in interpretation regardless of which sediment criteria were used. It should also be noted that sample HHASE-1, which contained the highest concentrations of all but one analyte, was collected upstream from the HHA and it is highly unlikely that it was influenced by the HHA. Therefore, for the samples that may have been

impacted by the HHA, none exceeded the NOAA or WDOE criteria, and only the Lowest Effect level for barium was detected using the Ontario criteria.

6.5 Contaminant Assessment

The field investigation included an investigation of two main areas: ground water in the northern parking lot and surface water and sediment in the river. As part of the ground water study, it was determined that ground water generally flows northwest.

Contamination by petroleum products continues to be a problem in ground water. Organic compounds and metals were detected in all of the ground water samples. The wells closest to the pumping station contained the highest concentrations of organic compounds. The petroleum hydrocarbons and organic compounds are probably due the former tanks located in this area. Given the direction of ground water flow, it is likely that contamination from this area is flowing into the tributary located north of the area and from there into the Little Patuxent.

The metals in ground water are at their highest concentrations close to the building. Their presence could be due to the fill used in this area or may indicate another source area. The metals may be migrating into the tributary. Well HHAME-2 is located downgradient from HHAME-4 and has similar metals but at lower concentrations. This may be due to contaminant migration; however, metals are generally immobile and therefore may not migrate far from the source.

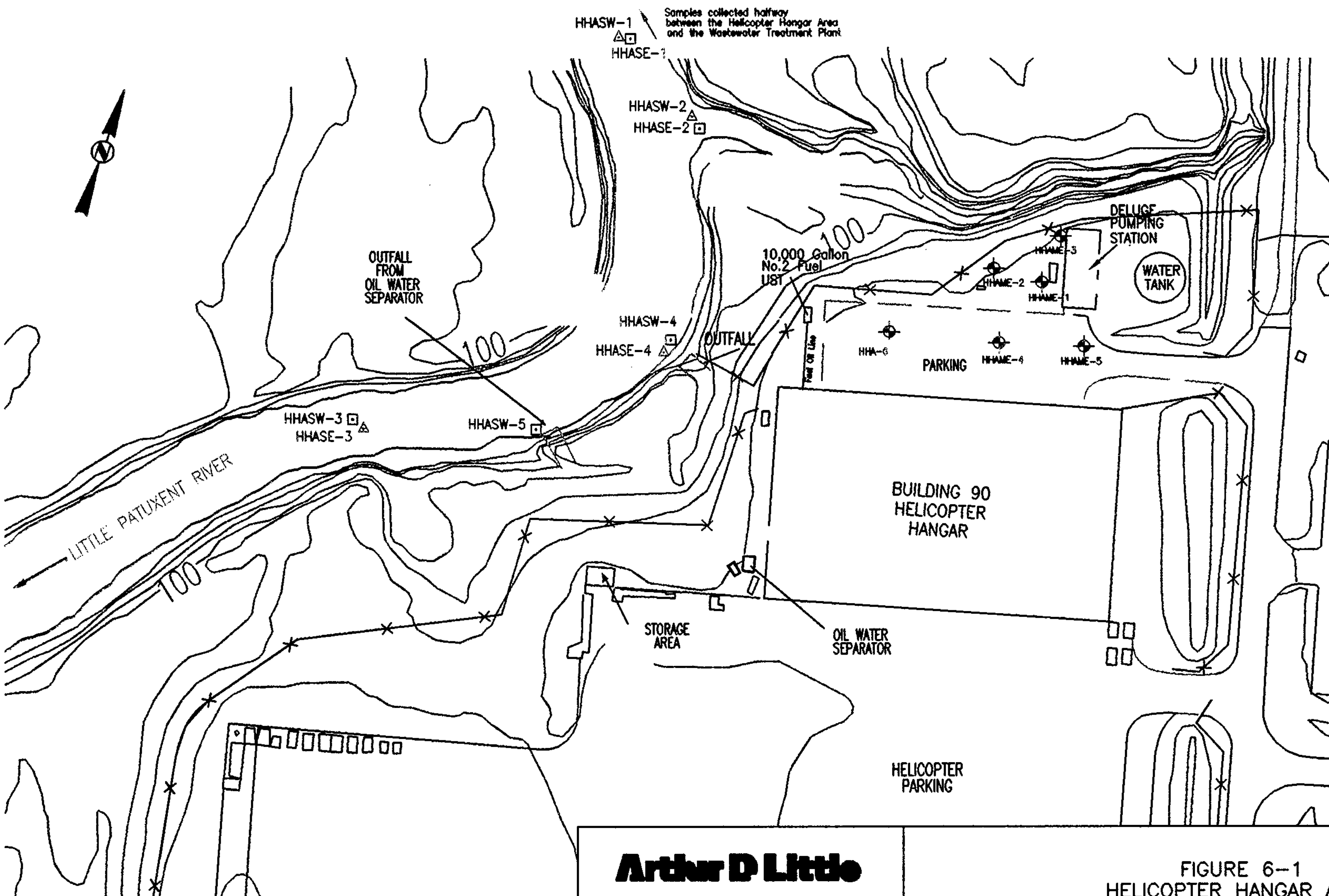
Based on a comparison of sediments with NOAA guidelines and the surface water with AWQC, it appears that the HHA is not having an adverse impact on the Little Patuxent River. If contaminants are migrating into the river, they are sufficiently diluted for their concentrations to fall below the comparison criteria.

6.6 Data Gaps and Recommendations

Data Gaps	Proposed Action	Rationale
1. Source of the metals contamination is unknown.	• Conduct an operations review of the HHA with an emphasis on historic operations and metal uses.	• Locate the source and determine if it is a continuing source requiring remediation.

Data Gaps	Proposed Action	Rationale
2. Upgradient metal concentrations are unknown.	• Install an upgradient well and sample ground water for metals.	• Determine if metals are naturally elevated.
3. It is unknown if contamination is migrating into the tributary.	• Collect surface water/sediment samples in the tributary. Re-attempt collection of sediment sample HHASE-5 at oil water separator outfall.	• Data are necessary to determining if ground water is discharging to the tributary and for conducting the human health risk assessment.
4. Ground water quality north of the tributary is unknown.	• Install a well north of the tributary and sample ground water.	• Determine if ground water contamination is migrating beneath the tributary.

The USAEC is continuing its evaluation of the Hangar 90 Area in the form of an RI. Also, the USAEC will be conducting an evaluation of the ecological risk presented to the BRAC parcel; this will include the Little Patuxent River. Details of these investigations can be found in the final RI workplans for the Hangar 90 area, expected to be released in May 1995 and the workplans for the ecological risk assessment, to be released in late October 1995.



LEGEND

- ⊡ SURFACE WATER LOCATION
- △ SEDIMENT LOCATION
- ⌖ MONITORING WELL LOCATION

SCALE

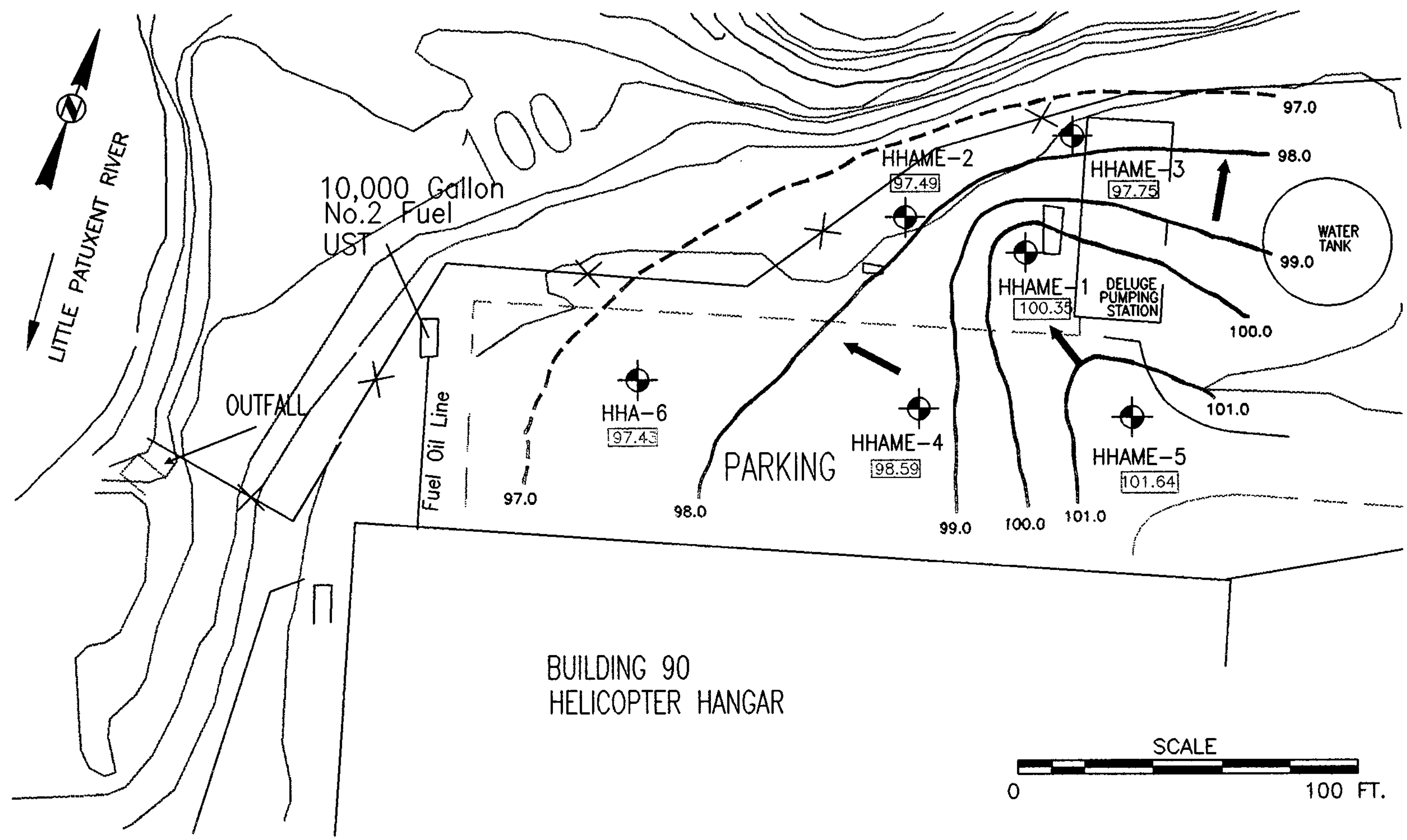
0 240 FT

Arthur D Little

APPROVALS	DATE
DRAWN	
CHECKED	
QA/CONTROL	
TECH REVIEW	
PROJ MNGR	

FIGURE 6-1
HELICOPTER HANGAR AREA
SITE LAYOUT AND SAMPLING LOCATIONS

PREPARED FOR: USAEC	SCALE: 1 IN. = 120 FT.
DATE: APRIL 1995	DWG. NO.: BLDG90
SOURCE: USAEC, 1992	SHEET 1 OF 1



LEGEND

HHA-6 97.43 — MONITORING WELL LOCATION AND WATER ELEVATION (ft AMSL) MEASURED ON 1/27/94

90.5 — WATER LEVEL ELEVATION CONTOUR (ft AMSL)

90.5 - - INFERRED WATER LEVEL ELEVATION CONTOUR (ft AMSL)

DIRECTION OF GROUND WATER FLOW

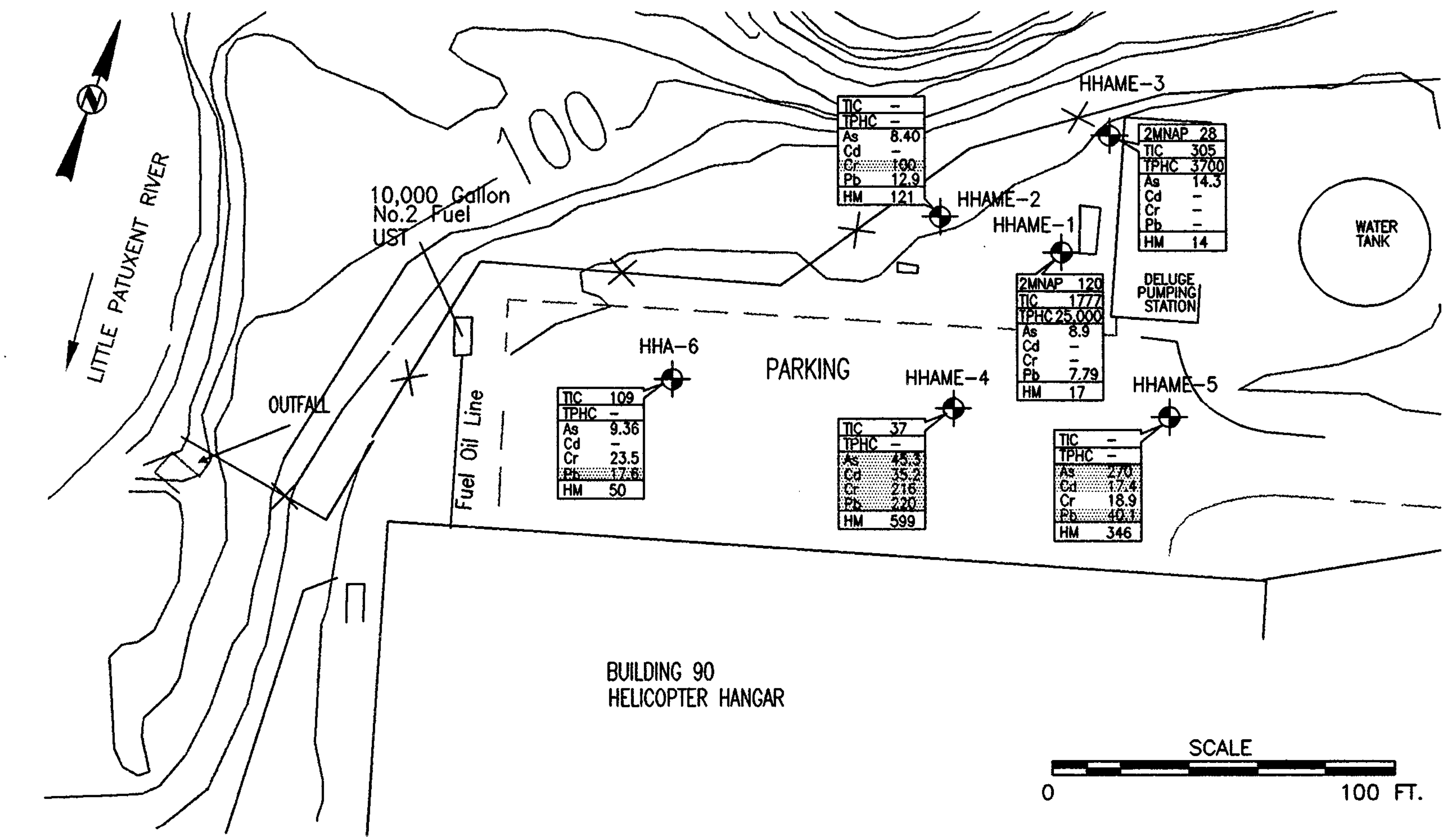
Arthur D Little

APPROVALS		DATE
DRAWN	MSB	4/3/95
CHECKED		
QA/CONTROL		
TECH REVIEW		
PROJ MNGR		

TITLE

FIGURE 6-2
HELICOPTER HANGAR AREA
GROUND WATER CONTOUR MAP

PREPARED FOR: USAEC	SCALE: 1 IN. = 50 FT.
DATE: APRIL 1995	DWG. NO.: 67069-047
SOURCE: USAEC, 1992	SHEET 1 OF 1



LEGEND

HHA-6 — MONITORING WELL LOCATION AND WATER ELEVATION (ft AMSL) MEASURED ON 1/27/94

2MNAP — 2-METHYLNAPHTHALENE
TIC — TOTAL TENTATIVELY IDENTIFIED COMPOUNDS
TPHC — TOTAL PETROLEUM HYDROCARBONS
As — ARSENIC
Cd — CADMIUM
Cr — CHROMIUM
Pb — LEAD
HM — TOTAL HEAVY METALS

ALL CONCENTRATIONS IN $\mu g/L$

SHADING INDICATES CONCENTRATIONS ABOVE MCLs

– — NOT DETECTED

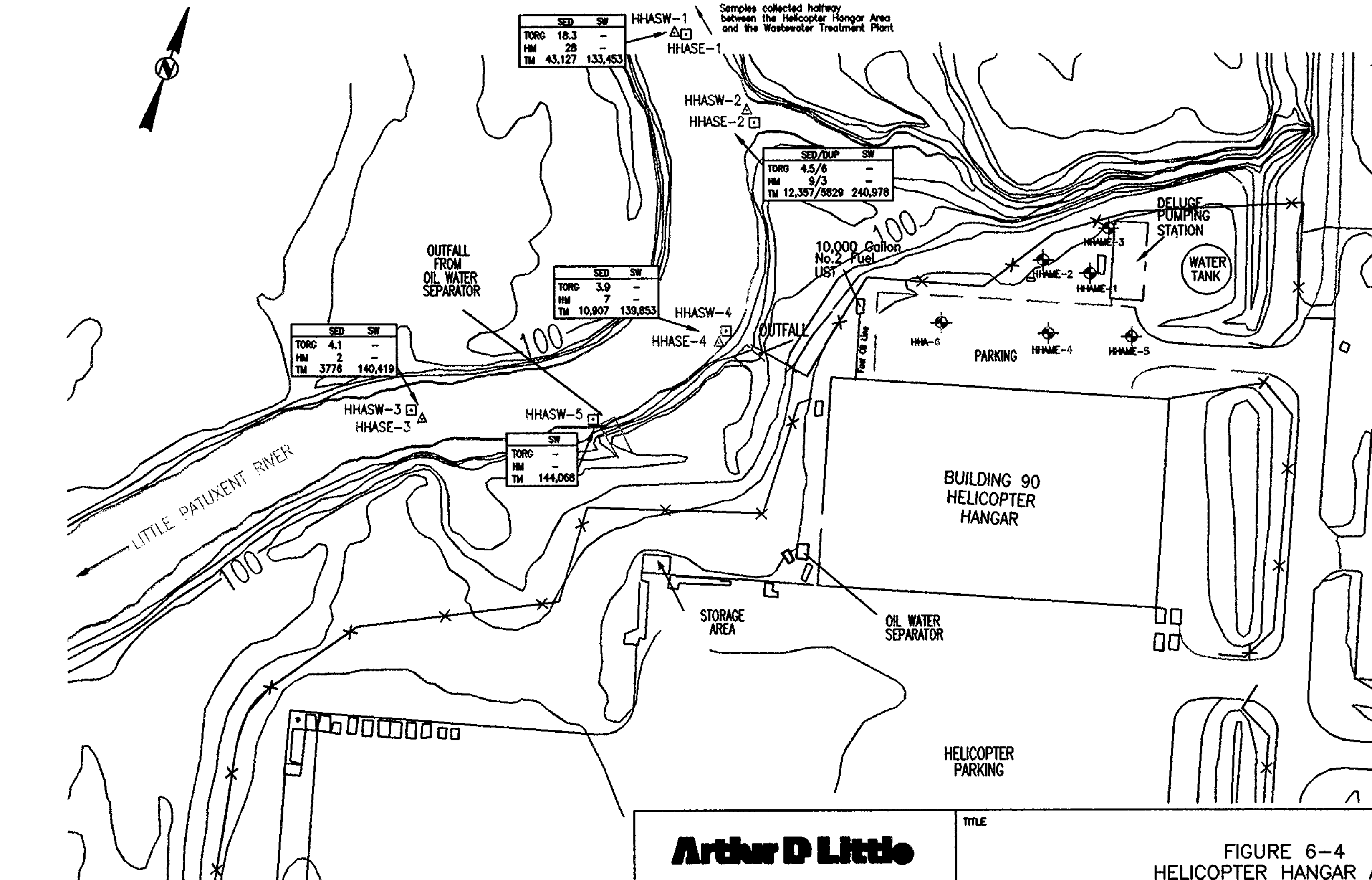
Arthur D Little

APPROVALS	DATE
DRAWN	
CHECKED	
QA/CONTROL	
TECH REVIEW	
PROJ MNGR	

TITLE

FIGURE 6–3
HELICOPTER HANGAR AREA
DISTRIBUTION OF CONTAMINANTS IN GROUND WATER

PREPARED FOR: USAEC	SCALE: 1 IN. = 50 FT.
DATE: APRIL 1995	DWG. NO.: 67069–051
SOURCE: USAEC, 1992	SHEET 1 OF 1



LEGEND

⊡	SURFACE WATER LOCATION
△	SEDIMENT LOCATION
⌖	MONITORING WELL LOCATION
TORG	TOTAL ORGANIC COMPOUNDS (VOCs, SVOCs, UNKNOWNS)
HM	TOTAL HEAVY METALS
TM	TOTAL METALS
-	NONE DETECTED
	SEDIMENT CONCENTRATIONS IN µg/G
	SURFACE CONCENTRATIONS IN µg/L

SCALE

0 240 FT.

Arthur D Little

APPROVALS	DATE
DRAWN	
CHECKED	
QA/CONTROL	
TECH REVIEW	
PROJ MNGR	

TITLE

FIGURE 6-4
HELICOPTER HANGAR AREA
DISTRIBUTION OF CONTAMINANTS IN SURFACE WATER AND SEDIMENT

PREPARED FOR: USAEC	SCALE: 1 IN. = 120 FT.
DATE: APRIL 1995	DWG. NO.: 67069-052
SOURCE: USAEC, 1992	SHEET 1 OF 1

Table 6-1: Ground Water Elevation Data for the Helicopter Hangar Area (HHA)

Site ID	MP Elevation ft MSL	Date: 1/20/94	
		DTW ft	Elevation ft MSL
HHAME-1	105.98	5.63	100.35
HHAME-2	105.39	7.90	97.49
HHAME-3	105.92	8.17	97.75
HHAME-4	105.42	6.83	98.59
HHAME-5	105.64	4.00	101.64
HHA-6	105.49	8.06	97.43

Notes:
MSL = Mean sea level
MP = Measuring point (notched or marked PVC unless noted otherwise)
DTW = Depth-to-water from the measuring point

Table 6-2 Summary of Laboratory Samples for the Helicopter Hangar Area - As Collected (Page 1 of 2)
Fort George G. Meade, Site Inspection Addendum

TYPE OF SAMPLE	SITE ID	FIELD ID	DATE	SITE TYPE	MEDIA CODE	N/E	DEPTH	TCL SVOC	TCL VOCs	PHC	TAL FMET	TAL UMET	TCLP ORG/ MET	PCB	EXP	Cl	NO3	TDS	SO4	PEST
SOIL INVESTIGATION																				
Background Soils	BKG-7	B1A0007	022893	AHOL	CSO	N	2-3 FT	0	0	0	0	1	0	0	0	0	0	0	0	1
	BKG-8	B1A0008	022893	AHOL	CSO	N	2-3 FT	0	0	0	0	1	0	0	0	0	0	0	0	1
	BKG-9	B1A0009	022893	AHOL	CSO	N	2-3 FT	0	0	0	0	1	0	0	0	0	0	0	0	1
Drilling Soil Sample	HHA-6	H1B0006	012993	BORE	CSO	N	10-12 FT	0	1	1	0	0	0	0	0	0	0	0	0	0
Auger Soils	HHASS-1	H1A0001	-	AHOL	CSO	N	-	0	0	0	0	0	0	0	0	0	0	0	0	0
	HHASS-2	H1A0002	-	AHOL	CSO	N	-	0	0	0	0	0	0	0	0	0	0	0	0	0
	HHASS-3	H1A0003	-	AHOL	CSO	N	-	0	0	0	0	0	0	0	0	0	0	0	0	0
	HHASS-4	H1A0004	-	AHOL	CSO	N	-	0	0	0	0	0	0	0	0	0	0	0	0	0
Field Blank	93QC-104	Q1XF104	012993	FBLK	CSO	N	10-12 FT	0	1	1	0	0	0	0	0	0	0	0	0	0
Rinse Blank	93QC-204	Q1XR204	012993	RNSW	CSO	N	10-12 FT	0	1	1	0	0	0	0	0	0	0	0	0	0
SURFACE WATER/SEDIMENT INVESTIGATION																				
Sediment Samples	HHASE-1	H1D0001	012194	STRM	CSE	N	0-6 IN	1	1	1	0	1	0	0	0	0	0	0	0	0
	HHASE-2	H1D0002	012194	STRM	CSE	N	0-6 IN	1	1	1	0	1	0	0	0	0	0	0	0	0
	HHASE-3	H1D0003	012194	STRM	CSE	N	0-6 IN	1	1	1	0	1	0	0	0	0	0	0	0	0
	HHASE-4	H1D0004	012194	STRM	CSE	N	0-6 IN	1	1	1	0	1	0	0	0	0	0	0	0	0
Surface Water Samples	HHASW-1	H1T0001	012194	STRM	CSW	N	NA	1	1	1	0	1	0	0	0	0	0	0	0	0
	HHASW-2	H1T0002	012194	STRM	CSW	N	NA	1	1	1	0	1	0	0	0	0	0	0	0	0
	HHASW-3	H1T0003	012194	STRM	CSW	N	NA	1	1	1	0	1	0	0	0	0	0	0	0	0
	HHASW-4	H1T0004	012194	STRM	CSW	N	NA	1	1	1	0	1	0	0	0	0	0	0	0	0
	HHASW-5	H1T0005	012194	STRM	CSW	N	NA	1	1	1	0	1	0	0	0	0	0	0	0	0
Duplicates	94QC-402 (dup of HHASE-4)	Q1DD402	012194	STRM	CSE	N	0-6 IN	1	1	1	0	1	0	0	0	0	0	0	0	0
Rinse Blanks	94QC-257	Q1XR257	012194	RNSW	CSE	N	NA	1	1	1	0	1	0	0	0	0	0	0	0	0

Table 6-2 **Summary of Laboratory Samples for the Helicopter Hangar Area - As Collected (Page 2 of 2)**
Fort George G. Meade, Site Inspection Addendum

TYPE OF SAMPLE	SITE ID	FIELD ID	DATE	SITE TYPE	MEDIA CODE	N/E	DEPTH	TCL SVOC	TCL VOCs	PHC	TAL FMET	TAL UMET	TCLP ORG/ MET	PCB	EXP	Cl	NO3	TDS	SO4	PEST
GROUND WATER INVESTIGATION																				
Ground Water Samples	HHAME-1	H1ME001	012094	WELL	CGW	E	ND	1	1	1	1	1	0	0	0	0	0	0	0	0
	HHAME-2	H1ME002	012094	WELL	CGW	E	ND	1	1	1	1	1	0	0	0	0	0	0	0	0
	HHAME-3	H1ME003	012094	WELL	CGW	E	ND	1	1	1	1	1	0	0	0	0	0	0	0	0
	HHAME-4	H1ME004	012094	WELL	CGW	E	ND	1	1	1	1	1	0	0	0	0	0	0	0	0
	HHAME-5	H1ME005	012094	WELL	CGW	E	ND	1	1	1	1	1	0	0	0	0	0	0	0	0
	HHA-6	H1M0006	012094	WELL	CGW	E	ND	1	1	1	1	1	0	0	0	0	0	0	0	0
Rinse Blanks	94QC-258	Q1XR258	012094	RNSW	CGW	N	ND	1	1	1	1	1	0	0	0	0	0	0	0	0
Field Blanks	94QC-157	Q1XF157	012094	FBLK	CGW	N	ND	1	1	1	0	1	0	0	0	0	0	0	0	0

NOTES:

N/E indicates if sample location is new (N) or existing (E)

IRDMIS Site Type Codes: WELL=water, AHOL=auger hole, STRM=stream
OTFL=outfall, FBLK=field blank, RNSW=rinse water

IRDMIS Media Codes: CGW=chemical ground water, CSO=chemical soil
CSW=chemical surface water, CSE=chemical sediment

Depths for ground water samples: UP=upper Patapsco, LP=lower Patapsco,
PX=Patuxent, ND=not determined or unclear; NA-not applicable

Shading indicates changes from the original SOW

TCL, VOCs - Volatile Organics, Target Compound List

TCL, SVOCs - Semivolatile Organics, Target Compound List

PHC - Petroleum hydrocarbons

TAL FMET - Filtered metals, Target Analyte List

TAL UMET - Unfiltered metals, Target Analyte List

ORG/MET - organics/metals

EXP - Explosives

TABLE 6-3: Field Screening and Metals Data for Ground Water from the Helicopter Hangar Area
Page 1 of 2

Site ID			HHA-6	HHA-6	HHAME-1	HHAME-1	HHAME-2	HHAME-2	HHAME-3	HHAME-3
Field Sample ID			H1M0006Y	H1M0006Z	H1ME001Y	H1ME001Z	H1ME002Y	H1ME002Z	H1ME003Y	H1ME003Z
Site Type			WELL	WELL	WELL	WELL	WELL	WELL	WELL	WELL
Screen Start Depth (ft bgs)			7	7	7+	7+	7+	7+	9+	9+
Screen End Depth (ft bgs)			17	17	17+	17+	17+	17+	19+	19+
Total/Dissolved			Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
Collection Date			20-Jan-94	20-Jan-94	20-Jan-94	20-Jan-94	20-Jan-94	20-Jan-94	20-Jan-94	20-Jan-94
QC Type										
FIELD PARAMETERS										
pH			6.47		6.71		6.04		6.47	
Conductivity (umhos/cm2)			0.444		0.307		0.094		0.197	
Temperature (C)			11.6		4.8		10.5		9.2	
Turbidity (NTU)			344		93		>999		6	
METALS (ug/L)	**MCL**	**SMCL/MCLG**								
Aluminum	--	50-200 G	5,290	112	535	--	2,950	--	--	--
Antimony	6	6 G	--	--	--	--	--	--	--	--
Arsenic	50	--	9.36	15.2	8.91	14.6	8.42	11.1	14.3	11
Barium	2,000	--	58.5	42.4	39.9	36	21.7	7.74	31.2	30.4
Beryllium	4	--	--	--	--	--	--	--	--	--
Cadmium	5	5 G	--	--	--	--	--	--	--	--
Calcium	--	--	71,100	74,100	40,000	38,300	12,400	11,400	22,600	22,600
Chromium	100	--	23.5	--	--	--	100 *	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--
Copper	--	1,000/1,300 S/G	28.8	--	38	--	188	--	--	--
Iron	--	300 S	36,700	19,300	45,600	30,700	31,900	6,580	26,600	23,700
Lead	15	--	17.6 *	14.5	7.79	--	12.9	--	--	--
Magnesium	--	--	10,400	10,400	5,380	5,150	1,800	1,660	3,100	3,070
Manganese	--	200 S	922	874	1,480	1,390	401	359	422	420
Mercury	2	--	--	--	--	--	0.128	--	--	--
Nickel	100	--	--	--	--	--	--	--	--	--
Potassium	--	--	9,260	9,310	5,070	5,120	2,740	1,930	3,140	2,970
Selenium	50	--	--	--	--	--	--	--	--	--
Sodium	--	--	8,970	9,280	6,700	6,560	3,130	3,270	8,110	8,280
Vanadium	--	--	--	--	--	--	129	--	--	--
Zinc	--	5,000 S	47.8	--	--	--	--	26.8	--	--
HEAVY METALS			50	30	17	15	121	11	14	11
TOTAL METALS			142,828	123,448	104,860	87,271	55,781	25,245	64,018	61,081

NOTES:
Only detected analytes are included on this table, for full data set see the appropriate appendix
MCL - maximum contaminant level, MCLG (G) - MCL goal, SMCL (S) - secondary MCL
Asterisks (*) indicate analytes present above primary standards (e.g., MCL, maximum AWQC)~
Dashes (--) indicate that no standard (e.g., MCL, SMCL, MCLG) exists or that the analyte is present below detection limits
Action levels for lead and copper are listed under MCLs
Heavy metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag
Pluses (+) indicate that the screen interval is based on total depth measurments and assumes a 10-foot screen (no well log avalible)

TABLE 6-3: Field Screening and Metals Data for Ground Water from the Helicopter Hangar Area
Page 2 of 2

Site ID			HHAME-4	HHAME-4	HHAME-5	HHAME-5
Field Sample ID			H1ME004Y	H1ME004Z	H1ME005Y	H1ME005Z
Site Type			WELL	WELL	WELL	WELL
Screen Start Depth (ft bgs)			35+	35+	8+	8+
Screen End Depth (ft bgs)			45+	45+	18+	18+
Total/Dissolved			Total	Dissolved	Total	Dissolved
Collection Date			20-Jan-94	20-Jan-94	20-Jan-94	20-Jan-94
QC Type						
FIELD PARAMETERS						
pH			6.41		6.65	
Conductivity (umhos/cm2)			0.456		0.388	
Temperature (C)			10.7		8.1	
Turbidity (NTU)			>999		267	
METALS (ug/L)	**MCL**	**SMCL/MCLG**				
Aluminum	--	50-200 G	11,900	--	2,030	--
Antimony	6	6 G	--	59.7 *	--	--
Arsenic	50	--	45.3	--	270 *	4.69
Barium	2,000	--	246	30.4	54.6	19.6
Beryllium	4	--	1.24	--	--	--
Cadmium	5	5 G	35.2 *	--	17.4 *	--
Calcium	--	--	96,200	85,800	57,200	55,600
Chromium	100	--	216 *	--	18.9	--
Cobalt	--	--	82.2	--	--	--
Copper	--	1,000/1,300 S/G	375	--	--	--
Iron	--	300 S	186,000	--	131,000	27,000
Lead	15	--	220 *	--	40.1 *	--
Magnesium	--	--	16,800	10,200	6,840	5,280
Manganese	--	200 S	13,000	117	1,370	1,350
Mercury	2	--	0.918	0.221	--	--
Nickel	100	--	74.7	--	--	--
Potassium	--	--	8,260	6,580	7,450	7,450
Selenium	50	--	5.18	--	--	--
Sodium	--	--	10,500	10,800	7,830	8,430
Vanadium	--	--	532	--	--	--
Zinc	--	5,000 S	2,820	137	216	--
HEAVY METALS			599	60	346	5
TOTAL METALS			347,314	113,724	214,337	105,134

NOTES:
Only detected analytes are included on this table, for full data set see the appropriate appendix
MCL - maximum contaminant level, MCLG (G) - MCL goal, SMCL (S) - secondary MCL
Asterisks (*) indicate analytes present above primary standards (e.g., MCL, maximum AWQC)~
Dashes (--) indicate that no standard (e.g., MCL, SMCL, MCLG) exists or that the analyte is present below detection limits
Action levels for lead and copper are listed under MCLs
Heavy metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag
Pluses (+) indicate that the screen interval is based on total depth measurments and assumes a 10-foot screen (no well log avalble)

TABLE 6-4: Organic Compounds in Ground Water from the Helicopter Hangar Area
Page 1 of 1

Site ID			HHA-6	HHAME-1	HHAME-2	HHAME-3	HHAME-4	HHAME-5
Field Sample ID			H1M0006Y	H1ME001Y	H1ME002Y	H1ME003Y	H1ME004Y	H1ME005Y
Site Type			WELL	WELL	WELL	WELL	WELL	WELL
Screen Start Depth (ft bgs)			7	7+	7+	9+	35+	8+
Screen End Depth (ft bgs)			17	17+	17+	19+	45+	18+
Media			CGW	CGW	CGW	CGW	CGW	CGW
Collection Date			20-Jan-94	20-Jan-94	20-Jan-94	20-Jan-94	20-Jan-94	20-Jan-94
Total/Dissolved			Total	Total	Total	Total	Total	Total
QC Type								
VOLATILE ORGANIC COMPOUNDS (ug/L)	**MCL**	**MCLG/SMCL**						
TENTATIVELY IDENTIFIED COMPOUNDS (TICs)								
Total Number of TICs	–	–	2	6	0	3	0	0
Total Concentration of TICs	–	–	109	87	0	47	0	0
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)								
PHTHALATES								
Bis (2-Ethyl hexyl) Phthalate	–	–	–	–	–	–	48	–
POLYNUCLEAR AROMATICS								
2-Methylnaphthalene	–	–	–	120	–	28	–	–
PESTICIDES								
Endrin	2	2 G	–	18 *	–	–	–	–
TENTATIVELY IDENTIFIED COMPOUNDS (TICs)								
Total Number of TICs	–	–	0	17	0	15	6	0
Total Concentration of TICs	–	–	0	1,690	0	258	37	0
TOTAL SVOC			0	1,828	0	286	85	0
TOTAL PETROLEUM HYDROCARBONS (ug/L)	–	–	–	25,000	–	3,700	–	–

NOTES:
Only detected analytes are included on this table, for full data set see the appropriate appendix
MCL - maximum contaminant level, MCLG (G) - MCL goal, SMCL (S) - secondary MCL
Dashes (--) indicate that no standard (e.g., MCL, SMCL, MCLG) exists or that the analyte is present below detection limits
Pluses (+) indicate that the screen interval is based on total depth measurments and assumes a 10-foot screen (no well log available)
Asterisks (*) indicate analytes present above primary standards (e.g., MCL, maximum AWQC)~

TABLE 6-5: Field Screening and Metals Data for Surface Water from the Helicopter Hangar Area

Site ID			HHASW-1	HHASW-2	HHASW-3	HHASW-4	HHASW-5
Field Sample ID			H1T0001A	H1T0002A	H1T0003A	H1T0004Y	H1T0005Y
Site Type			STRM	STRM	STRM	STRM	STRM
Start Depth (ft bgs)			0	0	0	0	0
End Depth (ft bgs)			0.5	0.5	0.5	0.5	0.5
Media			CSW	CSW	CSW	CSW	CSW
Collection Date			21-Jan-94	21-Jan-94	21-Jan-94	21-Jan-94	21-Jan-94
Total/Dissolved			Total	Total	Total	Total	Total
QC Type							
FIELD PARAMETERS							
pH			6.92	7.04	6.78	6.97	6.8
Conductivity (umhos/cm2)			0.59	1.29	0.782	0.605	0.613
Temperature (C)			0.7	1.2	0.7	0.2	0.6
Turbidity (NTU)			128	90	31	100	106
METALS (ug/L)	**AWQC MAX**	**CONT**					
Aluminum	–	–	–	2,600	335	349	527
Barium	–	–	61.8	66.2	64.5	74.7	64.9
Calcium	–	–	31,400	32,500	28,700	28,900	30,400
Iron	–	–	452	5,180	793	841	1,330
Magnesium	–	–	6,390	6,140	6,410	7,080	6,440
Manganese	–	–	139	144	147	164	162
Potassium	–	–	5,010	4,250	4,950	5,420	5,120
Sodium	–	–	90,000	190,000	99,000	97,000	100,000
Zinc	120	110	–	97.7	19.6	24.3	24.3
HEAVY METALS			0	0	0	0	0
TOTAL METALS			133,453	240,978	140,419	139,853	144,068

NOTES:
Only detected analytes are included on this table, for full data set see the appropriate appendix
AWQC - ambient water quality criteria, MAX - maximum, CONT - continuous
Dashes (–) indicate that no standard (e.g., AWQC) exists or that the analyte is present below detection limits
Heavy metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag

TABLE 6-6: Organic Compounds In Sediment from the Helicopter Hangar Area
Page 1 of 1

Site ID			HHASE-1	HHASE-2	HHASE-3	HHASE-4	94QC-402
Field Sample ID			H1D0001A	H1D0002A	H1D0003A	H1D0004A	Q1DD402A
Site Type			STRM	STRM	STRM	STRM	STRM
Start Depth (ft bgs)			0	0	0	0	0
End Depth (ft bgs)			0.5	0.5	0.5	0.5	0.5
Media			CSE	CSE	CSE	CSE	CSE
Collection Date			21-Jan-94	21-Jan-94	21-Jan-94	21-Jan-94	21-Jan-94
QC Type							Dup of HHASE-4
VOLATILE ORGANIC COMPOUNDS (ug/g)			ND	ND	ND	ND	ND
SEMIVOLATILE ORGANIC COMPOUNDS (ug/g)	AWQC MAX	CONT					
PHTHALATES							
Di-n-butyl Phthalate	–	–	5.5	–	–	–	–
POLYNUCLEAR AROMATICS							
Fluoranthrene	3,980	–	0.09	–	–	0.062	–
TENTATIVELY IDENTIFIED COMPOUNDS (TICs)							
Total Number of TICs	–	–	6	5	4	2	2
Total Concentration of TICs	–	–	10.4	5.4	4.1	3.9	4
TOTAL SVOC			16	5	4	4	4
TOTAL PETROLEUM HYDROCARBONS	–	–	–	–	–	–	–

NOTES:
Only detected analytes are included on this table, for full data set see the appropriate appendix
AWQC - ambient water quality criteria, MAX - maximum, CONT - continuous
Dashes (–) indicate that no standard (e.g., MCL, SMCL, MCLG) exists or that the analyte is present below detection limits
NA-not analyzed; ND-no analytes detected in this class

TABLE 6-7: Metals in Sediment from the Helicopter Hangar Area

Site ID			HHASE-1	HHASE-2	HHASE-3	HHASE-4	94QC-402
Field Sample ID			H1D0001A	H1D0002A	H1D0003A	H1D0004A	Q1DD402A
Site Type			STRM	STRM	STRM	STRM	STRM
Start Depth (ft bgs)			0	0	0	0	0
End Depth (ft bgs)			0.5	0.5	0.5	0.5	0.5
Media			CSE	CSE	CSE	CSE	CSE
Collection Date			21-Jan-94	21-Jan-94	21-Jan-94	21-Jan-94	21-Jan-94
QC Type							Dup. of HHASE-4
	NOAA ER-L	ER-M					
METALS (ug/g)							
Aluminum	--	--	15,700	1,070	1,160	2,670	3,200
Barium	--	--	110	6.78	7.89	20	22.9
Beryllium	--	--	1.17	--	--	--	--
Calcium	--	--	1,280	315	136	332	382
Chromium	80	145	24.4	3.07	2.87	6.52	8.32
Cobalt	--	--	14.2	4.45	--	3.91	3.89
Copper	70	390	12.4	--	--	--	--
Iron	--	--	20,600	4,050	1,870	6,380	7,200
Lead	35	110	10.6	2.8	1.66	3.88	4.46
Magnesium	--	--	3,000	220	228	826	838
Manganese	--	--	327	32.3	52.2	90.5	103
Nickel	30	50	15.9	--	--	3.56	4.49
Potassium	--	--	1,830	--	245	532	558
Sodium	--	--	106	108	62.3	--	--
Vanadium	--	--	32.8	4.56	4.7	7.51	9.23
Zinc	120	270	62.5	12.3	5.75	19.5	22.3
HEAVY METALS			52	6	5	14	17
TOTAL METALS			43,127	5,829	3,776	10,895	12,357

NOTES:
Only detected analytes are included on this table, for full data set see the appropriate appendix
NOAA - National Oceanographic and Atmospheric Administration Guidelines (ER-L = effects range-low; ER-M - effects range-median)
Dashes (--) indicate that no standard (e.g., MCL, SMCL, MCLG) exists or that the analyte is present below detection limits
Heavy metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag

Table 6-8: Comparison of Criteria for Sediments from the Helicopter Hangar Area
All Concentrations in µg/g

Metals	On-Site Maximum Concentration(1)	NOAA(2)		Ontario(3)		FSEDQUAL(4)	
		ER-L	ER-M	Lowest Effect	Severe Effect	Hyalella	Microtox
Aluminum	15,700	--	--	--	--	27,000	--
Barium	110	--	--	6	33	--	--
Beryllium	1.17	--	--	--	--	--	--
Calcium	1,280	--	--	--	--	--	--
Chromium	24.4	80	145	26	110	280	--
Cobalt	14.2	--	--	50	--	--	--
Copper	12.4	70	390	16	110	840	--
Iron	20,600	--	--	2%	4%	--	--
Lead	10.6	35	110	31	250	720	260
Magnesium	3,000	--	--	--	--	6,100	--
Manganese	32.7	--	--	460	1,100	1,800	-
Nickel	15.9	30	50	16	75	--	31
Potassium	1,830	--	--	--	--	--	--
Vanadium	32.8	--	--	--	--	--	--
Zinc	62.5	120	270	128	820	1,100	490

Notes:

(1) Maximum concentration detected during the SIA (1993).

(2) Long, E.R. and L.G. Morgan, August 1991. *The Potential for Biological Effects on Sediment-Sorbed Contaminants Tested in the National Status and Trends Program*. National Oceanographic and Atmospheric Administration. Seattle, WA NOS OMA 52. ER-L = Effects range low; ER-M = effects range medium.

(3) Persuad, D., et. al., 1991. *The Provincial Sediment Quality Guidelines*. Water Resources Branch, Ontario Ministry of the Environment (Draft).

(4) Cubbage and Breidenbach, June 1994. *Creation of Freshwater Sediment Quality Database and Preliminary Analysis of Freshwater Apparent Effects Thresholds*. Washington Department of Ecology. Freshwater Apparent Effects Thresholds from the model FSEDQUAL for Hyalella and Microtox.

7.0 Physical Characterization and Contaminant Assessment of the Inactive Landfill No. 2 (IL2)

7.1 Introduction and Background

The IL2 is located south of Tipton Airfield and about 450 feet north of Little Patuxent River (Figures 1-2 and 7-1). The landfill, an unlined rubble disposal facility, was used from 1952 to 1964, with some additional activity after 1970.

An SI was conducted for the IL2 in 1992 (EA Engineering, Science and Technology, 1992). During the SI, one deep and five shallow monitoring wells were installed and sampled. The shallow wells are screened in the unconfined lower Patapsco aquifer, a 30 to 35 foot thick layer of sand and gravel. The deep well is screened in the Patuxent aquifer, approximately 120 to 130 feet below grade. The confining layer, the Arundel formation, is approximately 95 feet thick.

Ground water in the lower Patapsco was found to flow south-southeast to southwest and mimics the topographic contours. A 12-foot difference in piezometric levels between MW-30S and MW-30D indicates a downward vertical gradient.

Low concentrations of VOCs, SVOCs, and pesticides were detected in ground water:

- VOCs were detected in four wells, but none of the compounds with MCLs were present above that standard.
- One well contained m-xylene (1.21 μg/L) below the MCL.
- Five wells contained detectable pesticides, but none of the compounds with MCLs were present above their standard.
- Three metals exceeded MCLs or action levels for total metals: arsenic (one well), beryllium (three wells), and lead (one well). However, no MCLs were exceeded for dissolved metals.

Two surface water samples were collected during the SI; neither surface water sample contained detectable VOCs or SVOCs, but 12 pesticides were detected. Numerous metals were detected but none was present above its MCL. However, the detection limit for both ground and surface water for beryllium (1.12 μg/L) is slightly above the MCL (1.0 μg/L).

7.2 Summary of Investigation for Study Area

The purpose of the SIA field investigation for the IL2 was to confirm the presence of previously detected metal contamination in ground water by resampling all monitoring wells in this area, and then evaluate any detected contamination in terms

of hydraulic transport and compare the new data to the historical data. The tasks completed to achieve this objective included:

- Collection of six ground water samples. Five samples were to be collected from the water table (lower Patapsco) aquifer and one from the confined (Patuxent) aquifer.
- Collection of depth-to-water information for interpreting the hydraulic conditions.

No changes to or deviations from the original scope of work were required for this area.

7.3 Physical Characterization of the Study Area

7.3.1 General Description

The 10-acre site is covered with tall grasses and trees. Due to a fence, half of the facility is accessed through the PWRC entrance and half through Tipton Airfield. The Little Patuxent River is located within 400 feet. Drainage from two storm water outfalls, originating at the Tipton Airfield, flows in surface water channels across the site.

According to the ecological investigation, the land cover consists of woodland, scrub/shrub areas, shrub/emergent/open-water interspersed areas, and miscellaneous fill-material/brush areas. Non-tidal wetlands are located north, west, and south of the site.

7.3.2 Hydrogeology

The geologic interpretation of the aquifers at IL2, presented in the SI (EA Engineering, Science and Technology, 1992b), has not been reassessed during the SIA because there was no geologic portion of the investigation. As mentioned in Section 7.1, six wells exist at the IL2, one of which is installed in the confined Patuxent aquifer and five of which are installed in the unconfined lower Patapsco aquifer.

A complete round of depth-to-water measurements was collected on February 16, 1993. The measurements are reported along with their corresponding elevations on Table 7-1. Ground water elevations ranged from 97.64 to 93.36 feet MSL in the unconfined aquifer. Ground water is flowing radially from a ground water mound (Figure 7-2). The mound is inferred based on the topographic contours. Figure 7-2 illustrates the direction of ground water flows.

No wells are located north of the IL2, therefore the direction of flow cannot be determined for that area. Based on the topographic contours, it is not unlikely that ground water also flows radially to the north. If that is the case, there may not be a location in which an upgradient well could be installed.

The water level elevation in Patuxent formation well MW-30D is approximately 11 feet lower than the water level in the clustered lower Patpasco formation well MW-30S, indicating a strong downward vertical gradient. The direction of flow in the confined Patuxent aquifer could not be determined because there is currently only one data point in that aquifer at IL2.

Ground water elevations and directions of flow in the SIA are comparable to the SI data. The vertical gradient was slightly stronger during the SI measurements (14 feet difference) than during the SIA measurements, but was also in a downward direction.

7.4 Nature and Extent of Contamination

During the SIA field investigation, ground water samples were collected to evaluate the nature and extent of contamination. The results of these sampling efforts are described below. The data tables presented in this section only provide a summary of the contaminants detected. A complete summary of the data can be found in Appendix K. Table 7-2 provides a complete summary of the laboratory samples collected at the IL2, including site IDs, site types, media codes, and analytical parameters.

7.4.1 Chemical Results of Ground Water Analyses

Field Parameters: During the sampling process, field measurements were made of the ground water for pH, conductivity, temperature, and turbidity. The field parameters are indicative of the general water quality, and are found in Table 7-3.

For ground water samples from the lower Patapsco aquifer, pH ranged from 4.53 to 6.62. Conductivity ranged from 0.099 to 0.827 μmhos/cm^2. Temperature ranged from 8.1°C to 12.4°C. The range for turbidity was from 10 to greater than 999 NTUs. None of the measurements was outside the expected range; no trends were observable.

Metals: Metals are naturally occurring in soil and are found in ground water. Metals are the primary ingredient used in the composition of many different materials such as building materials, automobiles, tanks, airplanes, etc., and in paints and pigments. For approximately 12 years the IL2 was used as a disposal facility, thus increasing the potential for elevated metals concentrations in ground water. Six ground water samples were collected and analyzed for 27 total and dissolved (filtered) metals (Table 7-3). Eight metals were not detected above the method detection limit: antimony, cadmium, molybdenum, selenium, silver, tellurium, thallium, and tin.

For total metals, chromium exceeded its MCL at MW-30S; lead exceeded its action level at MW-30S and MW-29. SMCLs for aluminum, manganese, and iron were frequently exceeded by both the total and dissolved metal concentrations.

The metals data were also compared to the previous sampling results to determine if the concentrations were within the previous range. Three wells had metal concentrations above their previous maximum:

- At MW-29, previous maximum total (unfiltered) metal concentrations were exceeded for eight metals: beryllium, chromium, cobalt, copper, iron, lead, vanadium, and zinc. Lead exceeded its action level during February 1993. Previously, lead was below the standard.

- At MW-30S, previous maximum total metal concentrations were exceeded for 10 metals: aluminum, beryllium, chromium, cobalt, copper, iron, lead, nickel, vanadium, and zinc. Two metals, chromium and lead, exceeded their MCL and action level respectively. Previously only lead exceeded its action level.

- At MW-31, previous maximum total metal concentrations were exceeded for six metals: beryllium, chromium, cobalt, copper, iron, and vanadium. No MCLs were exceeded for either this or the previous data.

All of the MCL exceedences were for total metals; there were none for dissolved metals. Due to the natural presence of metals in ground water, it is often difficult to determine if detected metal concentrations are elevated due to site activities or represent background levels. At the IL2, no upgradient well exists, therefore, background metal concentrations were not established.

7.5 Contaminant Assessment

Total metal concentrations that exceed the MCLs or action level continue to be detected. In the SI (EA Engineering, Science and Technology, 1992b), two metals (arsenic and lead) exceeded their regulatory limit at one location each. In the SIA, standards were exceeded a total of five times (lead in four locations and chromium in one location). Although all of the wells are downgradient of the source area, the highest metal concentrations are found south and southeast of the IL2. The total metals are present in highest concentrations in MW-30S (451 μg/L), MW-31 (189 μg/L) and MW-29 (180 μg/L). Wells MW-27 and MW-28 have lower metal concentrations and are probably less influenced by source chemistry. The distribution of two metals that exceeded standards is illustrated in Figure 7-3.

The three locations at which previous maximum concentrations were exceeded, MW-29, MW-30S, and MW-31, are all downgradient of the source area. Given the location and increased number of MCL exceedences, it is not unlikely that an increased number and mass of metals are migrating from the source. However, it is also possible that the results reflect seasonal or natural variability.

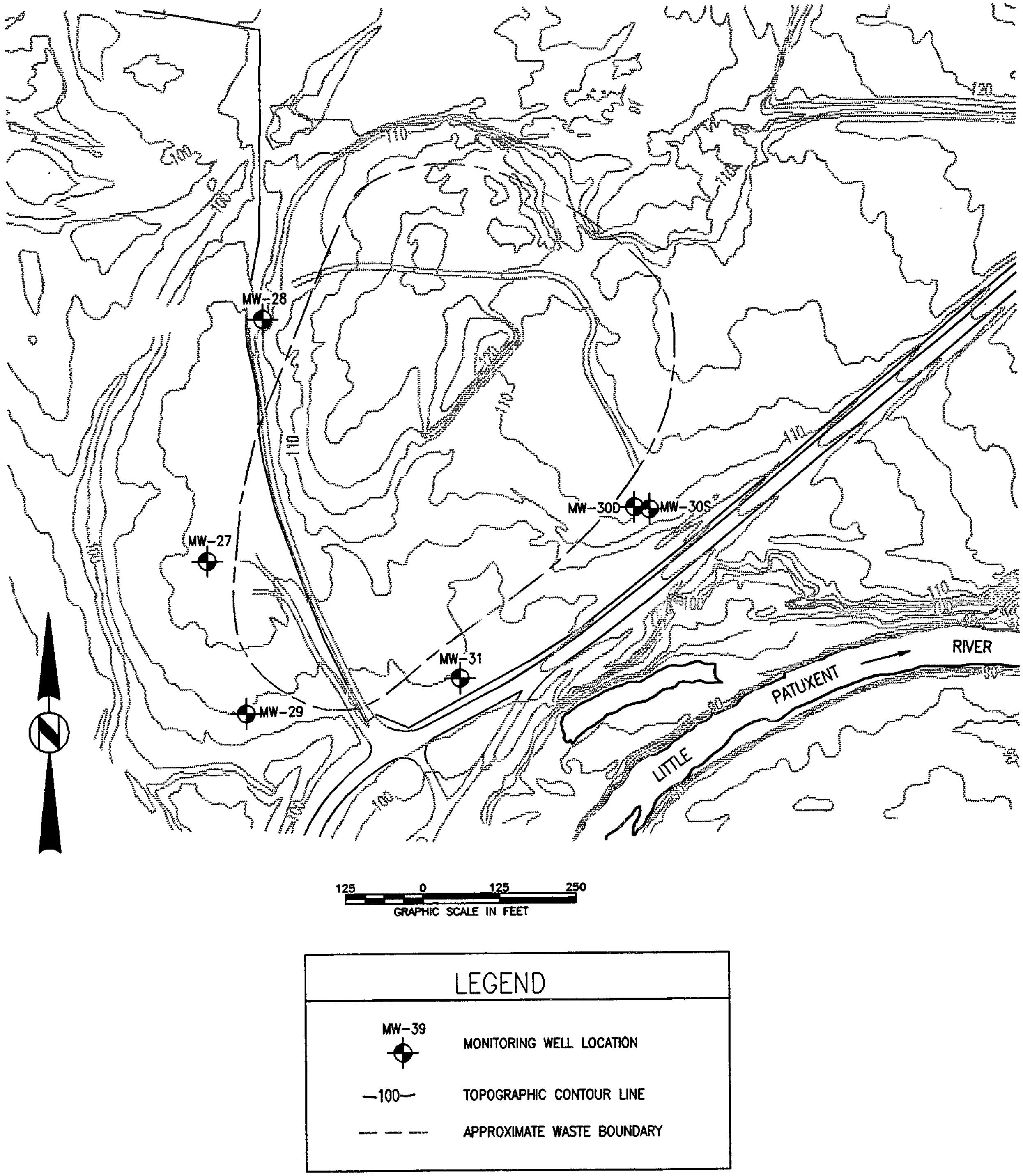
Migration of metals in the dissolved state is unlikely to be a problem because all dissolved metals were present below their standards.

7.6 Data Gaps and Recommendations

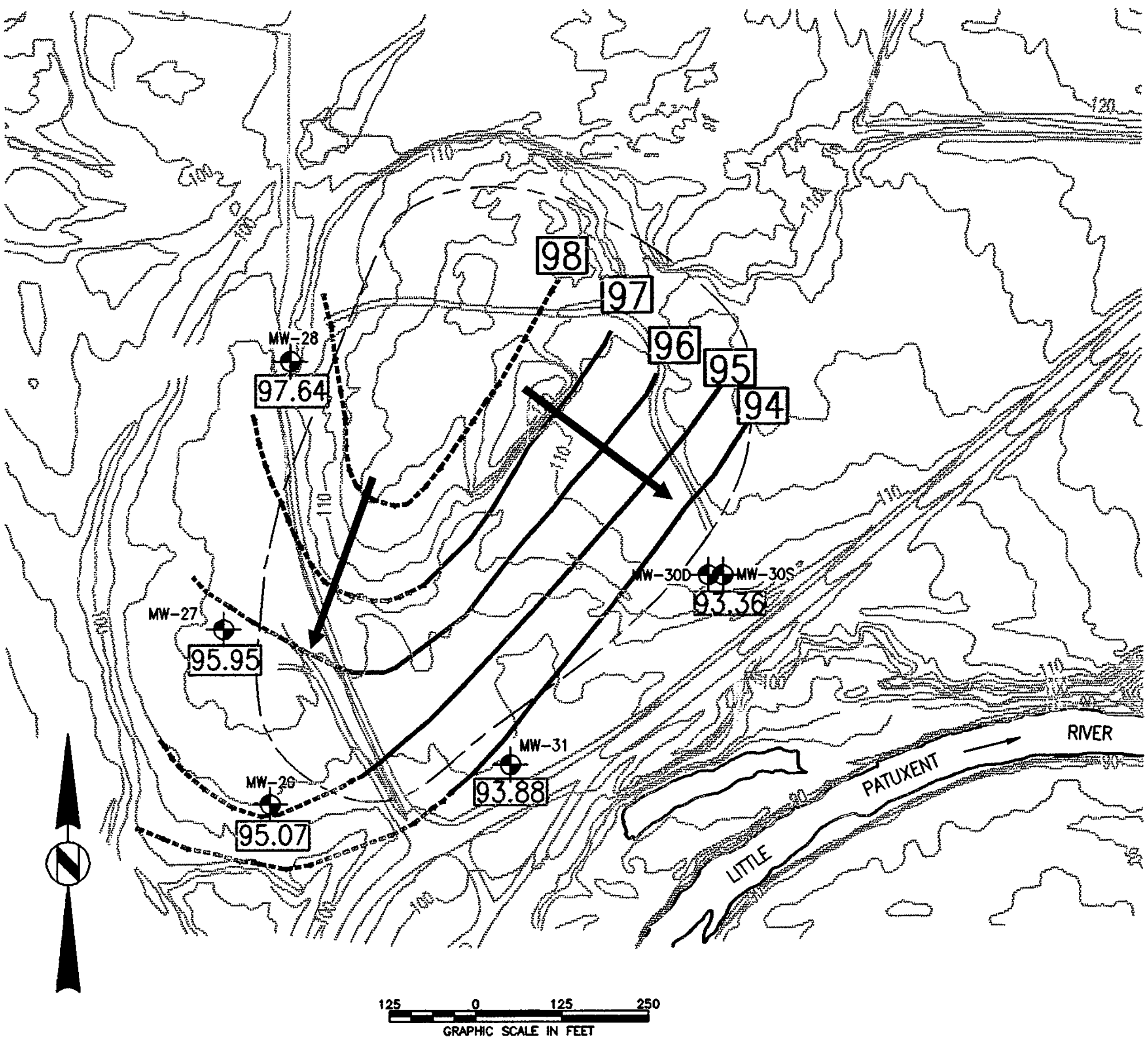
During the SIA at the IL2, the direction of ground water flow remained consistent with previous reports. The total metals concentrations continue to exceed MCLs in several downgradient wells; however, no dissolved metal exceeds its MCL. Metal contamination may potentially be flowing onto the BRAC parcel and into the Little Patuxent River. Several data gaps have been identified, including questions raised about the cause for the observed increase in metals contamination, the extent of contaminant migration, and the hydraulic connection between the ground water in this area and the river. The USAEC is conducting a RI at the IL2 which will include a detailed evaluation of site conditions. Workplans for that effort are expected to be released in October 1995 and detail the sampling and analysis program for the site.

Data Gaps	Proposed Action	Rationale
1. It is unclear if contaminant concentrations are increasing or reflect natural/seasonal variability.	• Collect ground water samples on a quarterly basis for one year. • Analyze samples for total and dissolved metals.	• The data should provide a sufficient database to evaluate contaminant trends and fluctuations.
2. It is unknown if VOCs, previous detected in MW-30D, are consistently present.	• Sample all wells for VOCs; if no VOCs are detected during the first quarter, eliminate analyses for remaining quarters.	• Provide a better basis for including or excluding VOCs from future monitoring and determine if the VOCs at MW-30D are consistently present.
3. The metals contamination on site may be migrating toward the river either south or southeast of the landfill; both directions may result in contamination flowing from the base onto the BRAC parcel.	• Install two monitoring wells downgradient (one south and one southeast) of the landfill. • Collect continuous split-spoon samples in both borings to evaluate the presence of layers that may hydraulically isolate the river from the ground water.	• Chemical data from the new wells will be used to evaluate if elevated site metals are migrating further downgradient toward the river; ground water data from adjacent to the river may also be used for the river pathway in the risk assessment.
4. The hydraulic connection between the ground water and the river is unknown.	• Install chart recorders for measuring water levels in the new monitoring well adjacent to the river and in a stilling well installed in the river. • Measure water levels weekly for one year.	• The relative elevations between the monitoring well and the river will indicate if the river is gaining or losing water to the ground water system. • The one year database will provide sufficient data to indicate if the interaction between the river and the ground water varies seasonally.

Data Gaps	Proposed Action	Rationale
5. Ground water flow direction north of the IL2 is unknown.	• Install up to three monitoring wells north of the IL2 (northwest, north, northeast). • Analyze samples for total and dissolved metals and VOCs.	• The data will indicate if ground water contamination is flowing to the north; if the new data indicates that ground water does not flow northward, the wells can be used to establish background metals concentrations.
6. UXO may be present in the subsurface.	• Conduct UXO clearance for all new sampling points.	• UXO present a safety concern that requires both downhole and surface clearances.
7. Hydraulic conductivity is unknown.	• Conduct hydraulic conductivity tests in two new wells, MW-30S, MW-30D and MW-29.	• Hydraulic conductivity data are necessary for determining ground water flow velocities and contaminant transport; the MW-30 cluster is included since there is no previous data for these wells, and MW-29 is included for comparison against previous data.
8. Location/elevation data are needed for the interpretation of hydrologic conditions.	• Survey in the new wells.	• Location data are needed for data entry into IRDMIS. • Elevation data are needed for interpretation of ground water elevation data.
9. A record of decision (ROD) maybe needed for site completion.	• Conduct Ecological and Human Health Risk Assessment (additional surficial soil samples may be required for the risk assessments). • Complete a Feasibility Study and Proposed Plan.	• Additional tasks are required for a ROD.



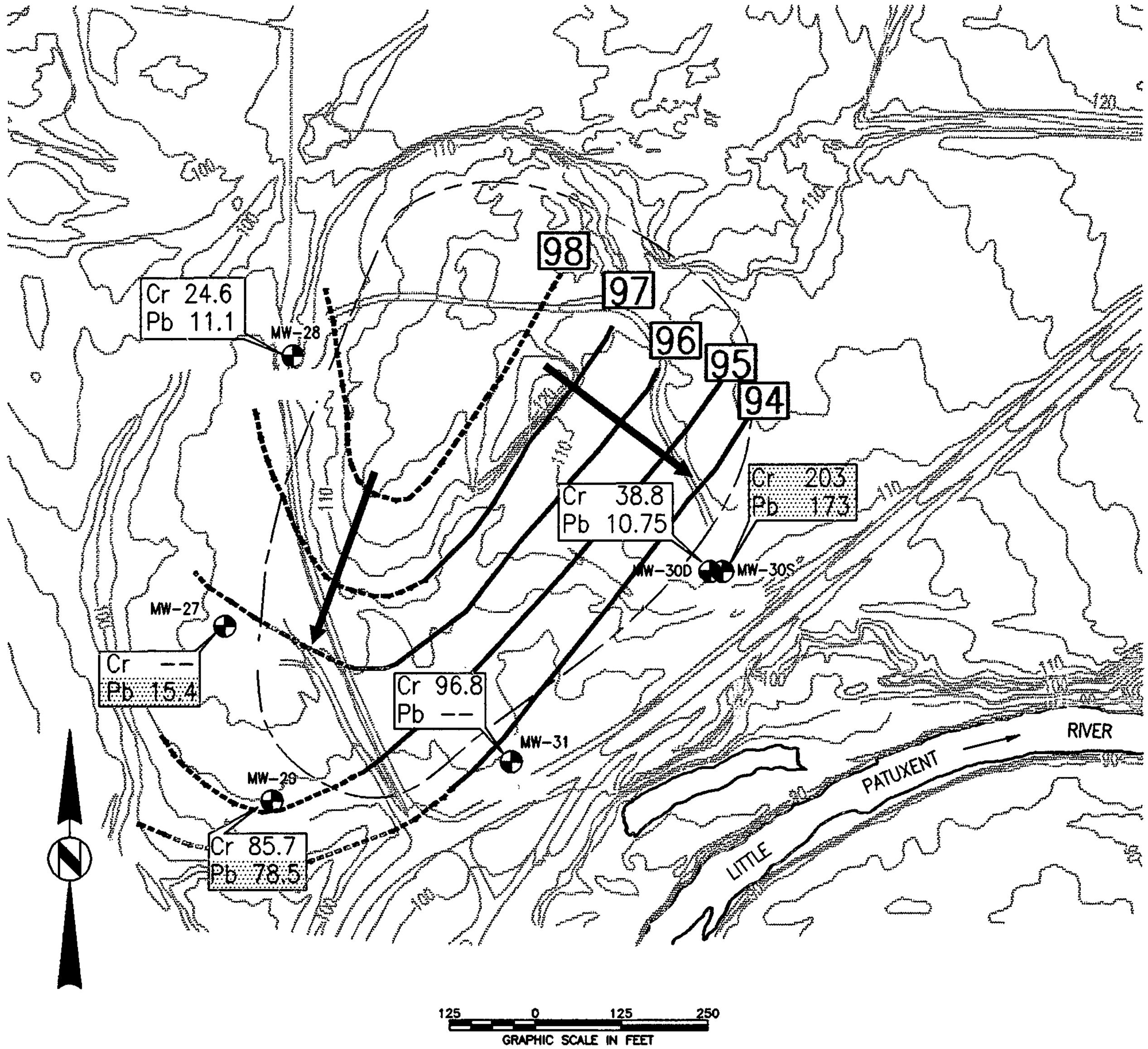
PREPARED FOR: USAEC			SOURCE: USATHAMA, 1992	TITLE: FIGURE 7-1: INACTIVE LANDFILL NO. 2 SITE LAYOUT AND SAMPLING LOCATIONS
DATE: NOV 1993	SCALE: 1"=250'	DWG. NO.: AIAL-2		



LEGEND

95.12 MW-39	MONITORING WELL LOCATION AND WATER ELEVATION (ft AMSL) MEASURED ON 2/16/93	95	WATER ELEVATION CONTOUR (ft AMSL)
		95	INFERRED WATER ELEVATION CONTOUR (ft AMSL)
100	TOPOGRAPHIC CONTOUR LINE		DIRECTION OF GROUND WATER FLOW
	APPROXIMATE WASTE BOUNDARY		

PREPARED FOR: USAEC			SOURCE: USATHAMA, 1992	TITLE: FIGURE 7-2: INACTIVE LANDFILL NO. 2 GROUND WATER CONTOUR MAP
DATE: NOV. 1993	SCALE: 1"=250'	DWG. NO.: 67069001	Arthur D Little	



LEGEND

MW-39	MONITORING WELL LOCATION	95	WATER ELEVATION CONTOUR (ft AMSL)
—100—	TOPOGRAPHIC CONTOUR LINE	95	INFERRED WATER ELEVATION CONTOUR (ft AMSL)
— — —	APPROXIMATE WASTE BOUNDARY		DIRECTION OF GROUND WATER FLOW
203	METALS EXCEEDING THE MCL IN GROUND WATER		
--	NOT DETECTED		

PREPARED FOR: USAEC			SOURCE: USATHAMA, 1992	TITLE: FIGURE 7–3: INACTIVE LANDFILL NO. 2 METALS EXCEEDING MCLs IN GROUND WATER
DATE: JULY 1993	SCALE: 1"=250'	DWG. NO.: 67069020	Arthur D Little	

Table 7-1: Ground Water Elevation Data for the Inactive Landfill No. 2

Site ID	MP Elevation ft MSL	Date: 2/16/93	
		DTW ft	Elevation ft MSL
MW-27	108.53	12.58	95.95
MW-28	106.70	9.06	97.64
MW-29	106.18	11.11	95.07
MW-30S	112.11	18.75	93.36
MW-30D	112.25	29.99	82.26
MW-31	106.59	12.71	93.88

Notes:
MSL - mean sea level
MP - measuring point (notched or marked PVC) unless noted otherwise in the field logs
DTW - depth-to-water from the measuring point

Table 7-2 Summary of Laboratory Samples for the Inactive Landfill No. 2 - As Collected
Fort George G. Meade, Site Inspection Addendum

TYPE OF SAMPLE	SITE ID	FIELD ID	DATE	SITE TYPE	MEDI CODE	N/E (1)	DEPTH	TCL SVOCs	TCL VOCs	PHC	TAL FMET	TAL UMET	TCLP ORG/ MET	PCB	EXP	Cl	NO3	TDS	SO4	PEST
Background Soils	BKG-10	B1A0010	012893	AHOL	CSO	N	0-0.5 FT	0	0	0	0	1	0	0	0	0	0	0	0	1
	BKG-11	B1A0011	012893	AHOL	CSO	N	0-0.5 FT	0	0	0	0	1	0	0	0	0	0	0	0	1
	BKG-12	B1A0012	012893	AHOL	CSO	N	0-0.5 FT	0	0	0	0	1	0	0	0	0	0	0	0	1
GROUND WATER INVESTIGATION																				
Ground Water Samples	MW-27	I1M0027	021793	WELL	CGW	E	LP	0	0	0	1	1	0	0	0	0	0	0	0	0
	MW-28	I1MOO28	021793	WELL	CGW	E	LP	0	0	0	1	1	0	0	0	0	0	0	0	0
	MW-29	I1MOO29	021793	WELL	CGW	E	LP	0	0	0	1	1	0	0	0	0	0	0	0	0
	MW-30S	I1M030S	021793	WELL	CGW	E	LP	0	0	0	1	1	0	0	0	0	0	0	0	0
	MW-30D	I1MO30D	021793	WELL	CGW	E	PX	0	0	0	1	1	0	0	0	0	0	0	0	0
	MW-31	I1MO031	021793	WELL	CGW	E	LP	0	0	0	1	1	0	0	0	0	0	0	0	0
Collocates	93QC-45 (dup of MW-30D)	Q1XD451	021793	WELL	CGW	E	PX	0	0	0	1	1	0	0	0	0	0	0	0	0
Field Blanks	93QC-15	Q1XF150	021793	FBLK	CSW	N	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Rinse Blanks	93QC-25	Q1XR250	021793	RNSW	CSW	N	0	0	0	0	0	1	0	0	0	0	0	0	0	0

NOTES:

(1) indicates if sample location is new (N) or existing (E)
IRDMIS Site Type Codes: WELL=water, AHOL=auger hole
FBLK=field blank, RNSW=rinse water
IRDMIS Media Codes: CGW=chemical ground water, CSO=chemical soil
CSW=chemical surface water
Depths for ground water samples: UP=upper Patapsco, LP=lower Patapsco,
PX=Patuxent, ND=not determined or unclear
NA - not applicable

TCL, VOCs - Volatile Organics, Target Compound List
TCL, SVOCs - Semivolatile Organics, Target Compound List
PHC - Petroleum hydrocarbons
TAL FMET - Filtered metals, Target Analyte List
TAL UMET - Unfiltered metals, Target Analyte List
ORG/MET - organics/metals
EXP - Explosives
TDS - Total Dissolved Solids
PEST - Pesticides

TABLE 7-3: Field and Metals Data for Ground Water From the Inactive Landfill Number 2
Page 1 of 2

Sample Location Identification	MCLs	SMCLs/ MCLGs		MW-27	MW-27	MW-28	MW-28	MW-29	MW-29	MW-30D	MW-30D
Field Sample ID				I1M0027Y	I1M0027Z	I1M0028Y	I1M0028Z	I1M0029Y	I1M0029Z	I1M030DY	I1M030DZ
Site Type				WELL	WELL	WELL	WELL	WELL	WELL	WELL	WELL
Screen Start Depth (ft bgs)				15	15	12+	12+	10	10	120	120
Screen End Depth (ft bgs)				30	30	22+	22+	25	25	130	130
Media				CGW	CGW	CGW	CGW	CGW	CGW	CGW	CGW
Total/Dissolved				Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
Collection Date				17-Feb-93	17-Feb-93	17-Feb-93	17-Feb-93	17-Feb-93	17-Feb-93	17-Feb-93	17-Feb-93
QC Type											
FIELD PARAMETERS											
pH				5.64		5.43		6.41		5.89	
Conductivity (umhos/cm2)				0.161		0.144		0.827		0.107	
Temperature (C)				12.4		10.4		8.1		13.3	
Turbidity (NTU)				10		>999		>999		799	
METALS (ug/L)	**MCLs**	**SMCLs/ MCLGs**									
Aluminum	--	50-200	S	481	--	3,490	--	19,900	--	2,790	271
Arsenic	50	--		6.09	--	7.56	--	12	9.9	--	--
Barium	2,000	--	G	50.8	46.9	84.8	62.1	480	309	105	204
Beryllium	4	--	G	--	--	1.17	--	3.54	--	1.75	--
Boron	--	--		--	--	--	--	298	274	--	--
Calcium	--	--		18,300	18,500	13,500	12,900	102,000	95,700	33,100	79,100
Chromium	100	--	G	--	--	24.6	--	85.7	--	38.8	18
Cobalt	--	--		--	--	--	--	58	29.8	--	--
Copper	1,300	1,000	G/S	--	--	33.1	--	123	--	--	--
Iron	--	300	S	22,600	12,300	25,800	366	132,000	43,800	25,900	92.8
Lead	15	--		15.4 *	--	11.1	--	78.5 *	--	10.7	--
Magnesium	--	--		4,720	4,710	5,540	4,890	17,700	15,900	357	--
Manganese	--	50	S	682	685	342	316	3,560	2,600	55.8	--
Mercury	2	--	G	--	--	--	--	0.512	--	--	--
Nickel	100	--	G	--	--	--	--	--	--	--	--
Potassium	--	--		2,610	2,500	3,620	2,890	15,600	14,000	24,000	62,300
Sodium	--	--		2,230	2,250	4,760	4,440	5,650	5,460	26,400	72,000
Vanadium	--	--		--	--	48.6	--	118	--	63.4	--
Zinc	--	5,000	S	31.3	--	32.9	--	135	--	38.2	--
TOTAL HEAVY METALS (1)				21	0	44	0	180	10	51	18
TOTAL METALS				51,727	40,992	57,296	25,864	297,802	178,083	112,861	213,986

NOTES:
Only detected analytes are included on this table, for full data set see appropriate appendix
Heavy Metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag
Lead has an action level of 15 ug/L and copper has an action level of 1300 ug/L
MCLs = maximum contaminant levels; S = secondary MCLs (SMCLs); G = MCL goals (MCLG)
Dashes indicate that no standard (e.g. MCL or SMCL/MCLG) exists or that the analyte is present below detection limits
Pluses (+) indicate that the depth is based on total depth measurement assuming a 10-ft screen and a 2.5-ft stick-up (no well log available)
Asterisks (*) indicate analytes present above primary standards (e.g., MCL, maximum AWQC)

TABLE 7-3: Field and Metals Data for Ground Water From the Inactive Landfill Number 2
Page 2 of 2

Sample Location Identification				93QC-451	93QC-451	MW-30S	MW-30S	MW-31	MW-31
Field Sample ID				Q1MD451Y	Q1MD451Z	I1M030SY	I1M030SZ	I1M0031Y	I1M0031Z
Site Type				WELL	WELL	WELL	WELL	WELL	WELL
Screen Start Depth (ft bgs)				120	120	15	15	12.5	12.5
Screen End Depth (ft bgs)				130	130	30	30	27.5	27.5
Media				CGW	CGW	CGW	CGW	CGW	CGW
Total/Dissolved				Total	Dissolved	Total	Dissolved	Total	Dissolved
Collection Date				17-Feb-93	17-Feb-93	17-Feb-93	17-Feb-93	17-Feb-93	17-Feb-93
QC Type				Dup of MW-30D					
FIELD PARAMETERS									
pH						6.2		6.62	
Conductivity (umhos/cm2)						0.233		0.099	
Temperature (C)						11.8		11.2	
Turbidity (NTU)						>999		>999	
METALS (ug/L)	**MCLs**	**SMCLs/ MCLGs**							
Aluminum	--	50-200	S	1,610	357	24,800	--	8,360	--
Arsenic	50	--		--	--	7.75	--	40.3	18.1
Barium	2,000	--	G	399	396	286	65.6	158	89.1
Beryllium	4	--	G	1.41	--	3.89	--	3.7	--
Boron	--	--		--	--	--	--	444	466
Calcium	--	--		148,000	157,000	36,800 *	30,300	147,000	144,000
Chromium	100	--	G	38.1	26.7	203	--	96.8	--
Cobalt	--	--		--	--	83.2	--	52.6	--
Copper	1,300	1,000	G/S	--	--	198	--	76.3	--
Iron	--	300	S	14,800	--	146,000 *	5,440	98,200 *	18,000
Lead	15	--		5.43	--	173	--	47.6	--
Magnesium	--	--		162	--	7,830	5,920	26,800	25,700
Manganese	--	50	S	28.1	--	1,910	1,270	2,200	1,950
Mercury	2	--	G	--	--	0.47	--	0.106	--
Nickel	100	--	G	--	--	62.5	--	--	--
Potassium	--	--		105,000	113,000	9,050	5,250	15,800	14,700
Sodium	--	--		130,000	130,000	3,420	3,300	10,200	10,100
Vanadium	--	--		30.6	--	310	--	236	--
Zinc	--	5,000	S	--	47.7	295	--	64.8	--
SUBTOTAL METALS (1)				**45**	**27**	**451**	**0**	**189**	**18**
GRAND TOTAL METALS				**400,075**	**400,827**	**231,433**	**51,546**	**309,780**	**215,023**

NOTES:
Only detected analytes are included on this table, for full data set see appropriate appendix
Heavy Metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag
Lead has an action level of 15 ug/L and copper has an action level of 1300 ug/L
MCLs = maximum contaminant levels; S = secondary MCLs (SMCLs); G = MCL goals (MCLG)
Dashes indicate that no standard (e.g. MCL or SMCL/MCLG) exists or that the analyte is present below detection limits
Pluses (+) indicate that the depth is based on total depth measurement assuming a 10-ft screen and a 2.5-ft stick-up (no well log available)
Asterisks (*) indicate analytes present above primary standards (e.g., MCL, maximum AWQC)

8.0 Physical Characterization and Contaminant Assessment of the Ordnance Demolition Area Site (ODA)

8.1 Introduction and Background

The ODA is located at Training Range 16, in the PWRC, in the southwestern area of the Base Closure parcel (Figures 1-2 and 8-1). The facility is used for demolition of obsolete ordnance.

Two different ordnance disposal methods are practiced at FGGM: above ground and below ground detonation. Detonation is completed by counter charging the ordnance with explosives, typically C-4. Three to five mortar rounds are stacked in the pit, explosive charges are placed on the rounds. and the entire assembly is detonated. Below ground detonation is conducted by placing the mortar and explosive charges in the pit and burying the entire assembly 2 to 6 feet prior to detonation. Below ground disposal requires treatment of the ordnance filler (water, dirt, sand) prior to disposal. Treatment is done by laying the ordnance out in a pit, placing explosive at certain locations, and detonating the entire assembly. The explosive limit on ordnance exploded on the surface at the ODA is five pounds of explosives, including the necessary amount of material to fulminate the round.

During the 1992 SI (EA Engineering, Science and Technology, 1992), two surface soil samples, labeled SS-27 and SS-28, were collected from the center of the detonation area at a depth of approximately 0.5 feet below the surface and analyzed for explosives and nitrate/nitrite. One sample, SS-28, contained 1.71 µg/g of RDX. The second sample had no detectable RDX. The precise locations of these samples within the ordnance detonation area could not be accurately pinpointed as this area has never been surveyed.

8.2 Summary of Investigation for Study Area

The objectives of the SIA field investigation at the ODA were to (1) determine if ordnance demolition may have resulted in soil contamination outside of the detonation area or with depth; and (2) determine if site activities have resulted in ground water contamination. The tasks proposed to achieve these objectives included:

- Completion of down-hole surveys for UXO during drilling for new monitoring wells
- Collection and analysis of 12 soil samples from 4 soil borings (3 depths from each)
- Completion of three soil borings as monitoring wells in the water table aquifer
- Collection and analysis of three shallow ground water samples

During field activities, several changes were made. Each of the changes was based on discussions with and approved by the USAEC geologist and COR:

- Due to the shallow water table throughout the site, the screened intervals in each monitoring well and bentonite seal and grout thickness deviated from the dimensions specified in the Geotechnical Requirements (USATHAMA, 1987).

- The proposed soil boring within the detonation pit was hand augered due to the threat of UXO from previous ordnance demolition in this area. Only two soil samples were collected at this location instead of the proposed three soil samples because the hardness of the ground limited the depth to which hand augering could be conducted.

- The originally proposed locations for the monitoring wells, as reported in the Draft Work Plan (Arthur D. Little, 1993), were altered upon observations made in the field regarding optimal placement of the monitoring wells and the relative safety of the investigation areas.

- The original scope of work did not include analysis of explosives in the ground water; however, the COR approved the additional analyses.

The wells were arranged so that one well would be located upgradient and two wells would be located downgradient of the ordnance detonation area. All three wells were installed to evaluate the potential for soil and ground water contamination resulting from ordnance disposal and determine the direction of ground water flow.

Eleven of the 12 proposed soil samples were collected. Three soil samples were collected from each of the borings completed as monitoring wells (ODAMW-1, ODAMW-2, and ODAMW-3). Due to health and safety considerations, the soil boring proposed within the bermed detonation area was hand augered by a contractor specializing in explosives handling, EHSI.

A total of three ground water samples, one from each of the newly installed ground water monitoring wells, was collected.

8.3 Physical Characterization of the Study Area

8.3.1 General Description

The area in which ordnance demolition is conducted is approximately 20 feet by 40 feet and surrounded by berms consisting of rubble material such as concrete chunks that stand 8 feet high. The entire site is surrounded by a second ring of earthen

berms. Shrapnel fragments and UXO were found in the open areas within the berm and in the surrounding woodland.

During the 1993 SIA UXO survey of the ODA, EHSI personnel laid out eight search lines approximately 100 feet each. Using electronic sensing equipment, EHSI personnel were able to detect UXO and other metallic objects. A total of 75 contacts were identified and removed. The items encountered included: 25 Stokes mortars flashtubes, 10 base detonating, 2 noses, 8 canisters, seven 74mm projectile rounds, one 105mm mechanical time fuze, 1 base fuze, 4 nose fuzes, three 40mm grenades, 1 adapter ring for a 155mm projectile and numerous pieces of fragments, 1 MK 26 hand grenade (remotely removed), and an M 112 block of C-4 (plastic explosive).

According to the ecological investigation (EA Engineering, Science and Technology, 1992b), land cover in the area is emergent grass with surrounding forest cover. Woodlands surround the site on the north, south, and west sides and wet meadows are located along the southeast and northwest border. A stream flows southward behind the eastern berm. According to the SI, the stream flows partially underground for a short distance and reappears as a seep.

A second, seasonal seep is located along the southern boundary, inside the outermost berm. The seep flows southwest along a drainage ditch, through a gap in the berm, and into a small stream. This seep was flowing during January 1993 but was observed to be dry during summer and fall visits.

8.3.2 Geology

The geographic location of this area suggests that the geology and hydrogeology in this area are similar to that described for the IL2. The geotechnical samples obtained from three soil borings (completed as wells) confirm that the property is located on the lower section of the Patapsco Formation. The soil borings were advanced to depths between 15 and 16 feet. The soils collected at ODAMW-2 and ODAMW-3 identify the soil as light brown, poorly sorted fine- to medium-grained sand. At ODAMW-2, the last 4 inches of the final split spoon showed a change in the lithology to light gray clayey silt. Observations made of the split spoons collected at ODAMW-1 indicate the similar lithology; however, the soil progressed to well sorted, fine-grained, sandy silt.

8.3.3 Hydrogeology

The lower Patapsco acts as the unconfined surficial aquifer at the ODA. The hydrogeologic field investigation of this aquifer at the ODA included the installation of three monitoring wells and collection of water level data.

A complete round of depth-to-water measurements was collected on February 24, 1993. The measurements are reported along with their corresponding elevations on

Table 8-1. A ground water contour map was derived from this round of measurements (Figure 8-2) indicating ground water flow is to the southwest. Ground water elevations ranged from 90.42 to 92.27 feet MSL. The locations of the wells with the highest and lowest water levels are 250 feet apart. The average ground water gradient across the site is $7x10^{-3}$ ft/ft.

8.4 Nature and Extent of Contamination

During the SIA field investigation, soil and ground water samples were collected to evaluate the nature and extent of contamination present that could potentially have an impact upon the BRAC parcel. The results of these sampling efforts are described below. The data tables presented in this section provide a summary of the contamination found. A complete summary of the data for each sample can be found in Appendix L. Table 4-2 provides a complete summary of the laboratory samples collected at the ODA, including site IDs, site types, media codes, and analytical parameters.

8.4.1 Soil

A total of 11 soil samples were collected from four soil borings advanced at the ODA during the SIA. The soil samples were analyzed for total metals and explosives.

Explosives: Soil samples were analyzed for nine explosives; none were detected above the detection limit (Table 8-3). Previously, RDX was detected in one surface soil sample collected from within the bermed area; however, the concentration of RDX detected during the SI (EA Engineering, Science and Technology, 1992b) did not exceed the health advisory.

The presence of explosives in soil at the ODA is not unexpected, given the historical use of this area for the demolition of ordnance. The absence of explosives in the soil samples collected during the SIA and their (explosives) presence during the SI is a function of the type of soil and environmental variables. Explosives concentrations are expected to be greater in the shallow soil where ordnance detonation has occurred. Explosive contamination tends to be localized, as it is relatively immobile in soil; thus, deeper soil contamination is not likely to exist unless an extremely large round is detonated.

Metals: Metals commonly associated with explosives include lead, copper, and compounds used in electroplating and pigments. Lead azide is a primary explosive produced by the reaction of sodium azide and lead salt (Sax and Lewis, 1987). Ammunition is frequently made with lead. Copper is an excellent conductor, thus it is often used in electrical wiring and in switches (Sax and Lewis, 1987). Copper and

zinc are used for brass shell casings. Soil samples were analyzed for 27 metals, of which eight were not detected (antimony, beryllium, cadmium, molybdenum, selenium, silver, tellurium, and thallium). Total metals concentration and a heavy metal subtotal concentration are provided with the data on Table 8-3.

The ODA soil metals data were compared against the background soil data to evaluate if metal concentrations are elevated at the ODA due to historical demolition activities. The comparison was conducted by construction frequency distribution diagrams for the combined data sets (see Section 3.3 for method discussion). Several metals were used for the comparison: copper, lead, and zinc were plotted because the metals are indicative of demolition activities. Chromium is also plotted as a comparison with the other metals.

- Copper. The frequency distribution plot for copper, Figure 8-3, indicates that copper is not present at FGGM in a single lognormal distribution. The lower 70 percent of the distribution lies on an approximately straight line, but the upper 30 percent deviates from that line. The upper 30 percent of the distribution comprise the twelve highest concentrations, of which four are from the ODA, three are from the DSY, and two are from the CFD. The significance for the ODA is that three of the four shallow soils collected from the soil borings lie above the lognormal distribution and therefore likely represent elevated concentrations. The highest copper concentration was detected in the shallow soil sample collected from the center of the demolition area and is higher than all other concentrations (47.1 µg/g at ODASB-4A versus the next highest concentration of 23.6 µg/g at BKG-18 from the DSY). Elevated copper levels at the ODA are supported by the fact that at each of the ODA soil borings, copper was present at its highest concentration at the surface and decreased with depth. The vertical distribution of copper is indicative of a surface impact source.

- Lead. Most of the lead concentrations at FGGM fall on an approximately straight line, with the exception of the shallow soil sample collected in the center of the demolition area (Figure 8-3). Lead is present at ODASB-4A at a concentration significantly higher then all other soil samples collected during the RIA (260 µg/g at ODASB-4A versus the next high concentration of 13.5 µg/g at BKG-10 from the IL2). Lead, like copper, has a consistent vertical distribution of contaminants with the highest concentration found in the shallow sample and the lowest in the deepest sample.

- Zinc. Zinc concentrations generally fall on a straight line with the exception of two points (Figure 8-4). Shallow soil samples ODASB-4A and BKG-12 (from the IL2) fall above the line. Zinc also exhibits decreasing concentrations with depth at the ODA.

- Chromium. All of the chromium concentrations fall on a straight line (Figure 8-4). All of the chromium concentrations from the ODA fall on the straight line, indicating that chromium is unlikely to be significantly elevated above background at the ODA. The three background samples collected from the ODA (BKG-1, -2 and -3) have chromium concentrations (7.7 to 13.6 μg/g) that fall within the range of samples collected from the soil borings (5.31 to 19.6 μg/g).

In summary, elevated metals, consistent with metals associated with ordnance, are present in soils at the ODA. This is supported by the frequency distribution plots of specific metals and the consistency with which the metals concentrations decrease with depth. The total heavy metals sums also shows a general decrease with depth, with the exception of ODAMW-3, where the 0 to 2 and 5 to 7 feet samples have similar concentrations. The decrease with depth is most pronounced at ODASB-4, located in the center of the demolition area, in which 18 of the 19 metals detected decrease in concentration from the shallow to the deeper sample. The source area also has the highest concentration of metals for 14 of the 19 detected metals. In general, metals show a consistent pattern of decreasing concentrations with depth and away from the source.

8.4.2 Ground Water

A total of three ground water samples were collected. The samples were analyzed for VOCs, SVOCs, explosives, and total and dissolved metals. A summary of the chemical analysis including site IDs, site types, media codes, and analytical parameters is included in Table 8-2.

Field Parameters: During the sampling process, field measurements were made of the ground water for pH, conductivity, temperature, and turbidity. The field parameters are indicative of the general water quality, and are found in Table 8-4.

For ground water samples from the lower Patapsco aquifer, the pH ranged from 4.19 to 4.71. Conductivity ranged from 0.059 to 0.112 μmhos/cm^2. Temperature ranged from 7.2°C to 8.9°C. The range for turbidity was from below the detection limit to 436. None of the measurements was outside of the expected range although the pH was slightly lower than ground water from other areas of FGGM.

Volatile Organic Compounds: VOCs that may be encountered at the ODA would include those used to abet heat transfer and VOCs found in solvents used as metal degreasers and cleaners. Ground water samples were analyzed for 41 VOCs, of which two halogenated organics were detected; they are summarized on Table 8-5 along with their respective MCLs.

PCE and TCE were the two halogenated organics detected. The greatest concentration of VOCs was 12.6 μg/L at ODAMW-3 (Figure 8-5).

PCE is the only compound present exceeding its MCL. The MCL is exceeded at two locations, ODAMW-1 and ODAMW-3. The greatest concentration was found in the monitoring well located upgradient of the detonation pit (ODAMW-3). The location of the second MCL exceedence is downgradient of the detonation pit. Figure 8-5 illustrates the distribution of the detected VOCs.

Semivolatile Organic Compounds: SVOCs are used in plastics, which are frequently used in military explosives. Ground water was analyzed for 116 SVOCs, but none were detected (Table 8-5).

Explosives: Ground water samples were analyzed for nine explosives, of which three were detected and are summarized on Table 8-4, along with their respective Health Advisory (HA) limits. At present, there are no MCLs or SMCLs for the three compounds identified.

The explosives detected included HMX, RDX, and 2,4-dinitrotoluene (DNT). HMX and RDX are typically utilized in military plastic explosives, such as the C4 used at the ODA to dispose of ordnance. These compounds were detected in the ground water samples collected at two of the three monitoring wells (ODAMW-1 and ODAMW-2). The maximum concentration of explosives measured was 93.74 μg/L. The total explosives concentration in the second sample found to contain explosives was much lower, 37.67 μg/L. The HA of 2 μg/L for RDX was exceeded at both of the locations at which it was detected, whereas the HA for HMX was not. There are no regulatory standards reported for DNT in ground water.

The two wells in which explosives were found are located downgradient of the ordnance disposal area. Figure 8-3 illustrates the location of explosive contamination. Explosives are transported from the soil into the ground water due to soil permeability, solubility of contaminant, adsorption properties of the soil, and rain water infiltration. The shallow depth to ground water and the solubility of explosives increase the rate of contaminant migration. The relative leachability of explosives, is as follows (highest to lowest): RDX, TNT, 2,4-DNT, 2,6-DNT, HMX, and Tetryl (USAEC, 1993). The soils present at the ODA consist of primarily sands, which are highly permeable, and exhibit poor adsorption, thus increasing the likelihood of contaminants in the soil migrating downward to ground water. The two methods typically used to dispose of ordnance further contribute to its presence in ground water as energy produced from the explosion drives shrapnel and explosive materials downward.

Metals: Metals are often used in the composition of explosives (lead azide), in the construction of casings and projectiles (iron, aluminum, copper, zinc), and are used to aid in the detonation of explosives (copper switches), therefore it could be expected to find metals in the ground water, especially given the sandy soils present at the ODA. Ground water samples were analyzed for 27 metals, both total and dissolved analysis. Eleven metals were not detected: antimony, boron, cobalt, mercury, molybdenum, nickel, selenium, silver, tellurium, thallium, and tin. Metals that were detected are summarized on Table 8-2, along with their associated MCLs. It should be noted that the method detection limits for three metals, antimony, cadmium, and thallium, are greater than their MCLs, making it impossible to determine if MCLs have been exceeded for one or more locations.

No MCL exceedences were observed, except for cadmium at ODAMW-1. Cadmium is used in paints and as an alloy for electroplating.

At every monitoring well sampling location, the SMCLs for aluminum, iron, and manganese were exceeded in the sample analyzed for total metals. Also at every monitoring well location, the SMCLs for aluminum and manganese were exceeded in the samples analyzed for dissolved metals.

As discussed in Section 8.4.1, it appears that ordnance demolition has resulted in elevated metal concentrations in soil. The soil contamination extends spacially to all of the monitoring wells. Based on the soil investigation, it is not unlikely that metals concentration may be elevated in ground water. However, without an unimpacted, upgradient well, background metal concentrations cannot be determined. Therefore, it is difficult to determine if the metals present in ground water are due to site activities or are naturally occurring. Although explosive compounds have migrated into ground water, the metals may be sufficiently less mobile to limit downward migration, which causes ground water contamination.

8.5 Contaminant Assessment

Secondary explosives continue to be detected at the ODA; however, the matrices in which they were found are different. During the SI (EA Engineering, Science and Technology, 1992b), low levels of RDX were detected in the surface soil collected from within the ordnance detonation pit. During the 1993 SIA, explosives were not present in the soil samples; however, three explosive compounds (RDX, HMX, and DNT) were detected in the ground water at two locations downgradient of the detonation pit. The presence of explosives in these wells indicates that demolition activity in the source area is contributing to ground water contamination and that the contamination is moving toward the south in the direction of ground water flow.

Soil data indicate that metals are elevated in surface and subsurface soils. The metal distribution (the highest metal concentrations are in shallow soils and close to the source) is consistent with site use and support the likelihood of metals being elevated above background levels.

VOC contamination was detected at each sampling location; however, MCLs were exceeded by PCE in three locations and TCE in one location. The upgradient well, ODAMW-3, had the highest concentration of both PCE and TCE. VOC concentrations in ground water decreased from the upgradient well to the downgradient wells. The source of the VOC contamination is unclear but may be located in the northeast corner of the property.

8.6 Data Gaps and Recommendations

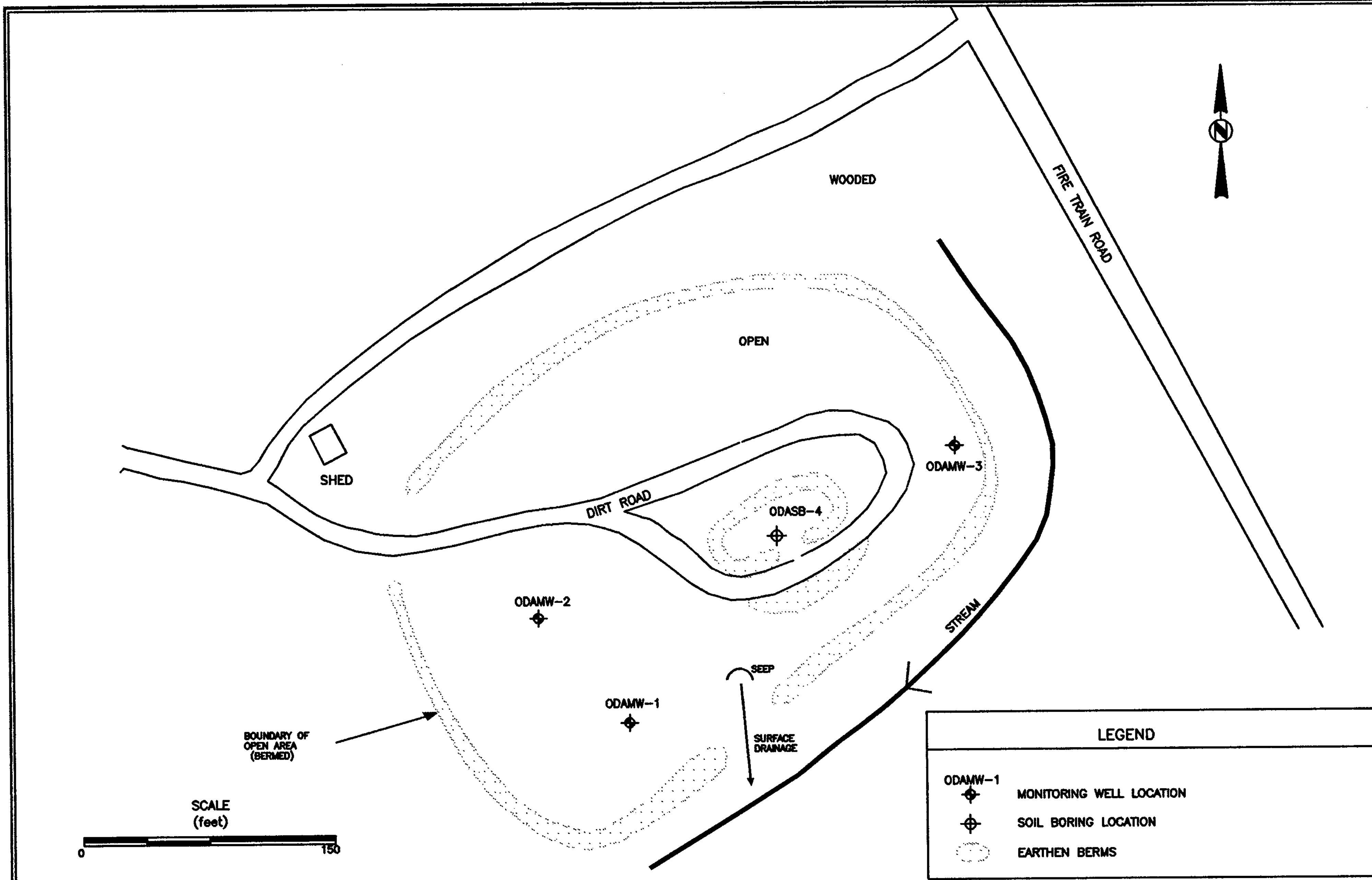
The SIA investigation confirmed the presence of contamination that was previously suspected. Contamination was suspected based on historical and present site use.

The SIA investigations determined the direction of ground water flow to be toward the southwest. Explosives and VOCs were detected in the ground water; metals are probably elevated in soils. Several data gaps were identified during this investigation, including the source and extent of the VOC contamination and the extent of explosive contamination in ground water. The following actions have been proposed to address the data gaps. The USAEC is conducting a RI at the ODA which will include a detailed evaluation of site conditions. Workplans for that effort are expected to be released in May 1995 and detail the sampling and analysis program for the site.

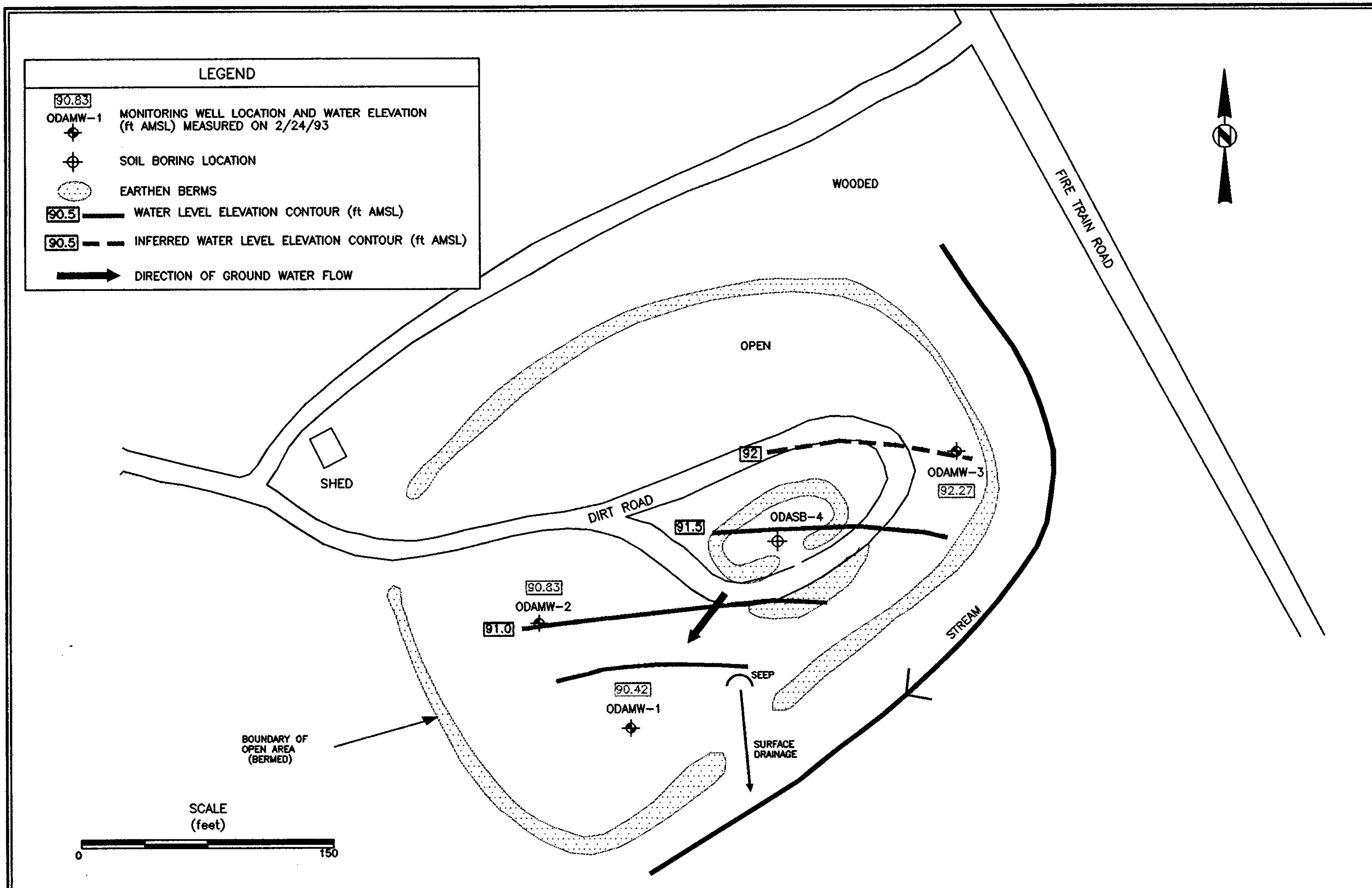
Data Gaps	Proposed Action	Rationale
1. The source of the VOC contamination, and both the source and extent of the explosive contamination, are unknown.	• Screen ground water shallow samples for VOCs using a field GC. • Screen approximately 10 ground water samples for explosives using an immuno assay technique. • Install a maximum of 4 monitoring wells downgradient of the known contamination; well locations will be based on the results of the field screening program, however, one of the wells will be placed adjacent to where the surface drainage enters the stream.	• The field screening data will be used to locate the extent of the plume, to aid in well placement, and limit the necessary number of permanent wells. • The cross-gradient wells will help delineate the plume to the east and the west. • The downgradient wells will be used to determine if the contamination is flowing off site.

Data Gaps	Proposed Action	Rationale
2. There is currently no well located upgradient of the area affected by VOCs; therefore background water quality is unknown.	• Install one upgradient well based on results of the field screening.	• Determine background ground water quality.
3. Ground water quality has not been confirmed at the ODA; also, there are no data to evaluate seasonal fluctuations.	• Collect ground water samples from new and existing wells quarterly for one year. • Analyze samples for VOCs, explosives and metals; the new locations will also be sampled for SVOCs during the first round, but if no SVOC contamination is detected, the SVOC analyses will be discontinued after the first sampling round.	• Data from the existing wells are necessary to confirm the previous results; data are needed from both the new and existing wells to define the extent of the contamination.
4. The hydraulic connection between the stream and the ground water is unknown.	• Collect continuous split-spoon samples from the well installed adjacent to the stream to evaluate the presence of the layers that may hydraulically isolate the stream from the ground water. • Install a surveyed gauge in the stream. • Collect stream water levels at the same time water levels are collected from the adjacent well.	• The relative elevations between the monitoring well and the stream will indicate if the stream is gaining or losing water to the ground water system.
5. Contaminants may have migrated into the stream.	• Collect two surface water/ sediment sample pairs; one pair will be collected from upstream of the impacted area; one pair will be collected from immediately downstream from where the surface drainage enters the stream.	• Surface water and sediment data are needed to evaluate the potential contaminant migration pathways; these data can also be used in the risk assessment.
6. UXO may be present in the subsurface.	• Conduct UXO clearance for all new sampling locations.	• UXO present a safety concern that requires both downhole and surface clearances.
7. The hydraulic conductivity of the aquifer is unknown.	• Conduct hydraulic conductivity tests in a maximum of five wells.	• Hydraulic conductivity data are necessary for determining ground water flow velocities and contaminant travel times.
8. There is no surveyed site map.	• Have surveyors create a new base map on AUTOCAD.	• The relationship of the demolition area and site boundary to the sampling points needs to be better understood.

Data Gaps	Proposed Action	Rationale
9. A Record of Decision (ROD) may be needed for site completion.	• Conduct Ecological and Human Health Risk Assessments (additional surficial soil data may be needed for the risk assessments). • Complete a Feasibility Study and a Proposed Plan.	• Additional items are required for a ROD.

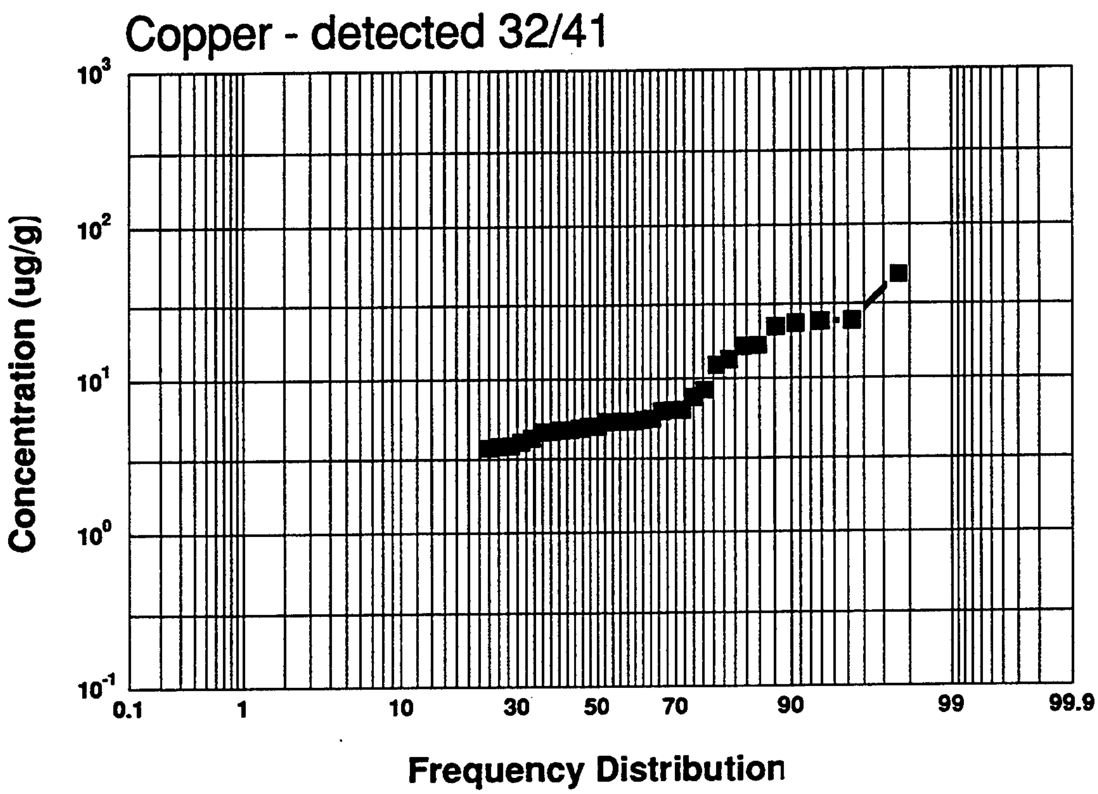


PREPARED FOR: USAEC			DRAWN BY: (INITIALS)	Arthur D Little	TITLE: FIGURE 8-1: ORDNANCE DEMOLITION AREA SITE LAYOUT AND SAMPLING LOCATIONS
DATE: NOV 1993	SCALE: 1" = 80'	DWG. NO. 67069059	APPROVED BY: (INITIALS)		



PREPARED FOR: USAEC			DRAWN BY: (INITIALS)	Arthur D Little	TITLE: FIGURE 8-2: ORDNANCE DEMOLITION AREA GROUND WATER CONTOUR MAP
DATE: NOV 1993	SCALE: 1" = 80'	DWG. NO. 67069-028	APPROVED BY: (INITIALS)		

Figure 8-3: Frequency Distribution of Copper and Lead in Background and ODA Soils



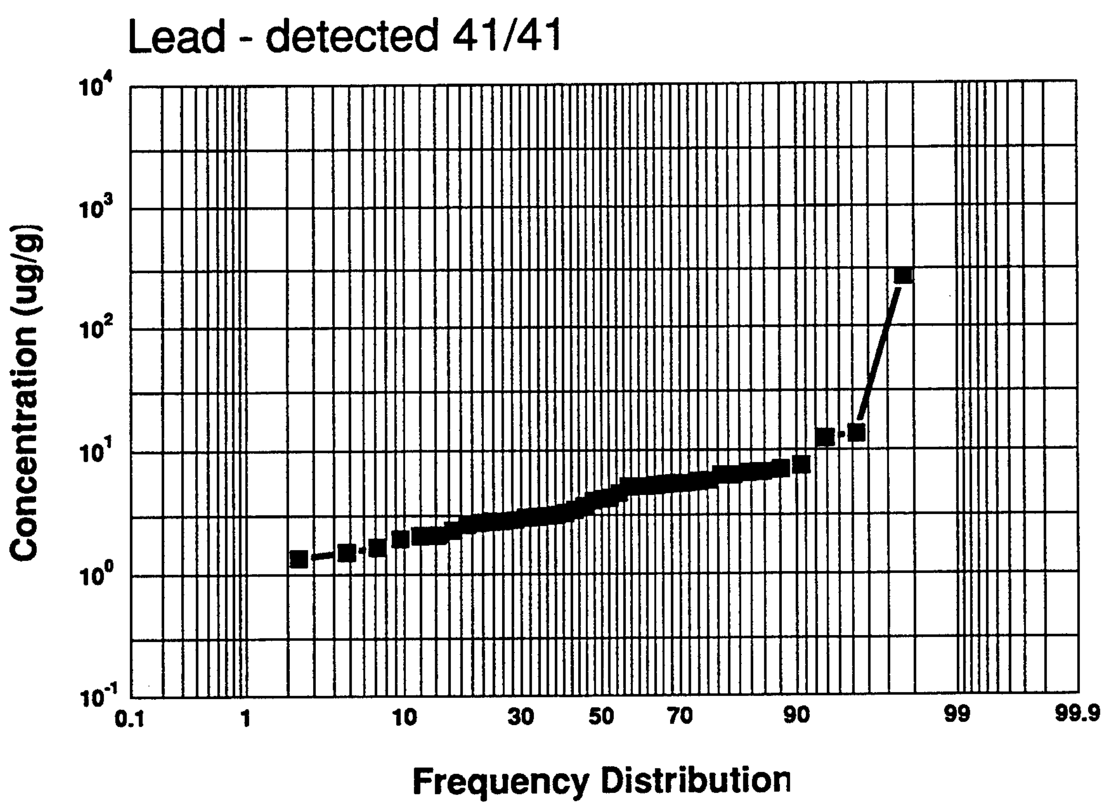
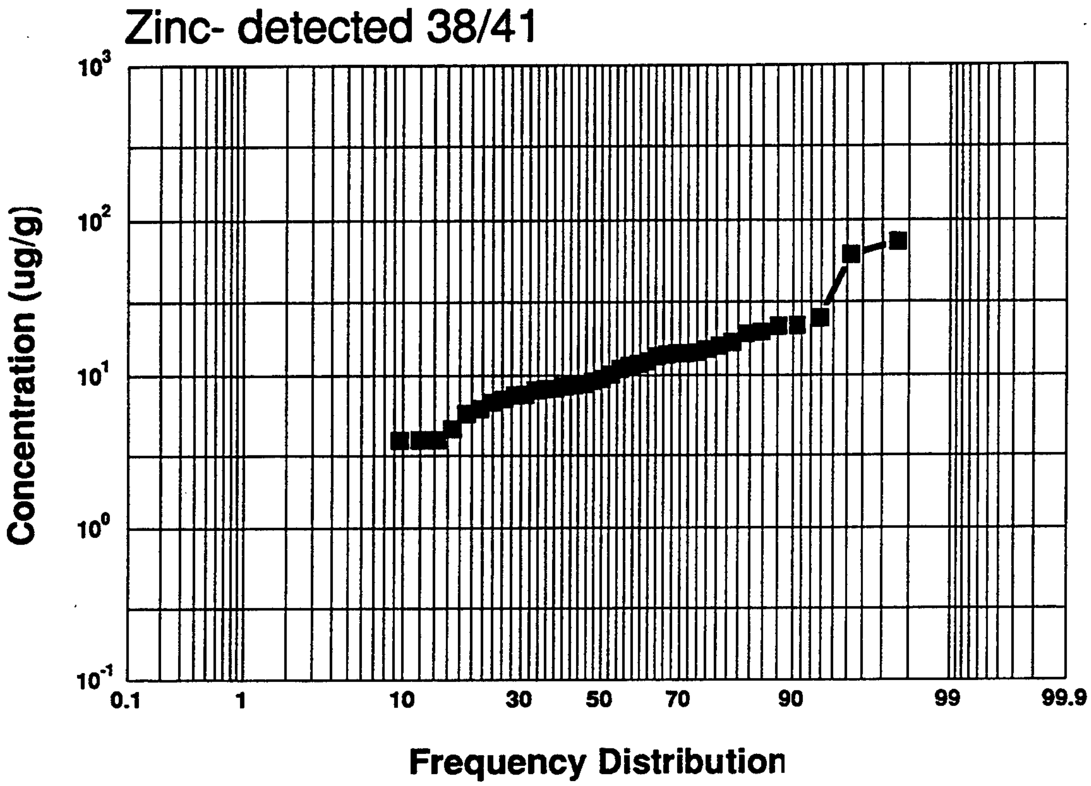
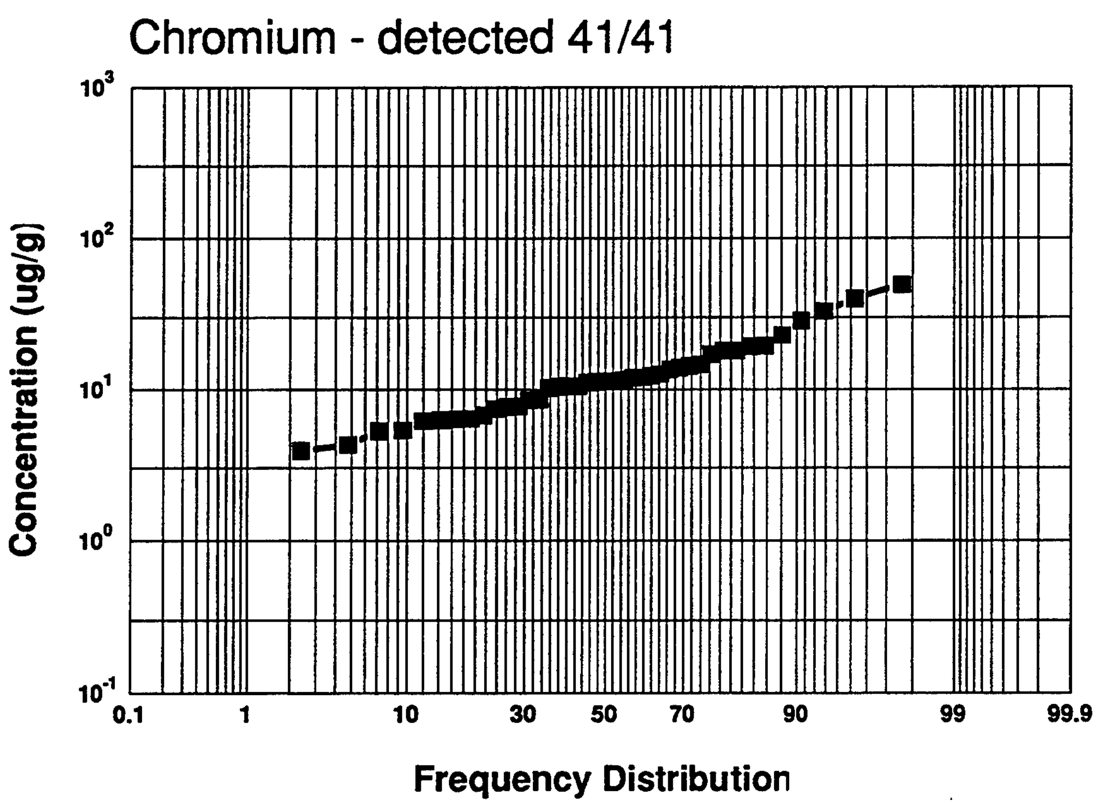
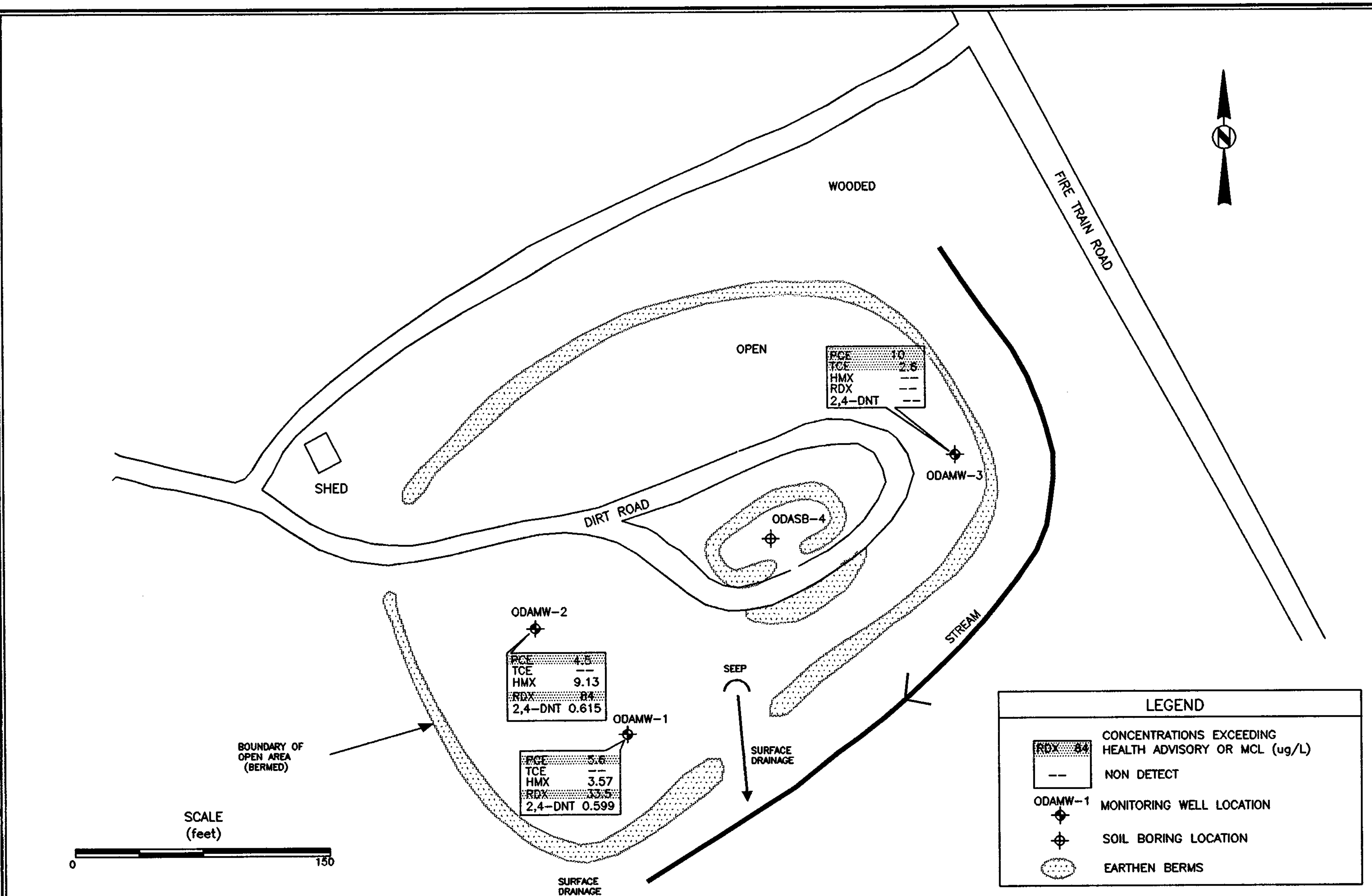


Figure 8-4: Frequency Distribution of Zinc and Chromium in Background and ODA Soils







PREPARED FOR: USAEC			DRAWN BY: (INITIALS)	Arthur D Little	TITLE: FIGURE 8-5: ORDNANCE DEMOLITION AREA DISTRIBUTION OF EXPLOSIVES AND VOCs IN GROUND WATER
DATE: NOV 1993	SCALE: 1" = 80'	DWG. NO. 67069-026	APPROVED BY: (INITIALS)		

Table 8-1: Ground Water Elevation Data for the Ordnance Demolition Area

Site ID	Ground Elevation ft MSL	MP Elevation ft MSL	Date: 2/24/93	
			DTW ft	Elevation ft MSL
ODAMW-1	93.22	95.42	5.00	90.42
ODAMW-2	95.03	97.41	6.58	90.83
ODAMW-3	95.89	98.35	6.08	92.27

Notes:
MSL - mean sea level
MP - measuring point (notched or marked PVC) unless noted otherwise
DTW - depth-to-water from the measuring point

Table 8-2 Summary of Laboratory Samples for the Ordnance Demolition Area - As Collected (Page 1 of 2)
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TYPE OF SAMPLE	SITE ID	FIELD ID	DATE	SITE TYPE	MEDIA CODE	N/E (1)	DEPTH	TCL SVOCs	TCL VOCs	PHC	TAL FMET	TAL UMET	TCLP ORG/ MET	PCB	EXP	Cl	NO3	TDS	SO4	PEST
SOIL INVESTIGATION																				
Drilling	ODAMW-1	O1B0001A	012293	BORE	CSO	N	0-2 FT	0	0	0	0	1	0	0	1	0	0	0	0	0
	ODAMW-1	O1B0001B	012293	BORE	CSO	N	5-7 FT	0	0	0	0	1	0	0	1	0	0	0	0	0
	ODAMW-1	O1B0001C	012293	BORE	CSO	N	10-12 FT	0	0	0	0	1	0	0	1	0	0	0	0	0
	ODAMW-2	O1B0002A	012593	BORE	CSO	N	0-2 FT	0	0	0	0	1	0	0	1	0	0	0	0	0
	ODAMW-2	O1B0002B	012593	BORE	CSO	N	5-7 FT	0	0	0	0	1	0	0	1	0	0	0	0	0
	ODAMW-2	O1B0002C	012593	BORE	CSO	N	10-12 FT	0	0	0	0	1	0	0	1	0	0	0	0	0
	ODAMW-3	O1B0003A	012693	BORE	CSO	N	0-2 FT	0	0	0	0	1	0	0	1	0	0	0	0	0
	ODAMW-3	O1B0003B	012693	BORE	CSO	N	5-7 FT	0	0	0	0	1	0	0	1	0	0	0	0	0
	ODAMW-3	O1B0003C	012693	BORE	CSO	N	10-12 FT	0	0	0	0	1	0	0	1	0	0	0	0	0
Hand Auger	ODASB-4	O1B0004A	012693	AHOL	CSO	N	0-2 FT	0	0	0	0	1	0	0	1	0	0	0	0	0
	ODASB-4	O1B0004B	012693	AHOL	CSO	N	5-7 FT	0	0	0	0	1	0	0	1	0	0	0	0	0
	ODASB-4	O1B0004C	NC	AHOL	CSO	N	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Background	BKG-1	B1A0001	012693	AHOL	CSO	N	0-3 FT	0	0	0	0	1	0	0	0	0	0	0	0	1
	BKG-2	B1A0002	012693	AHOL	CSO	N	0-3 FT	0	0	0	0	1	0	0	0	0	0	0	0	1
	BKG-3	B1A0003	012693	AHOL	CSO	N	0-3 FT	0	0	0	0	1	0	0	0	0	0	0	0	1
	BKG-27	B1A0027	011894	AHOL	CSO	N	2-3 FT	0	0	0	0	1	0	0	0	0	0	0	0	1
	BKG-28	B1A0028	011894	AHOL	CSO	N	2-3 FT	0	0	0	0	1	0	0	0	0	0	0	0	1
Field Blanks	93QC-100	Q1XF100	012293	FBLK	CSW	N	0	0	0	0	0	1	0	0	1	0	0	0	0	0
	93QC-101	Q1XF101	012593	FBLK	CSW	N	0	0	0	0	0	1	0	0	1	0	0	0	0	0
	93QC-102	Q1XF102	012693	FBLK	CSW	N	0	0	0	0	0	1	0	0	1	0	0	0	0	0
Rinse Blanks	92QC-200	Q1XR200	012293	RNSW	CSW	N	0	0	0	0	0	1	0	0	1	0	0	0	0	0
	92QC-201	Q1XR201	012593	RNSW	CSW	N	0	0	0	0	0	1	0	0	1	0	0	0	0	0
	92QC-202	Q1XR202	012693	RNSW	CSW	N	0	0	0	0	0	1	0	0	1	0	0	0	0	0

Table 8-2 Summary of Laboratory Samples for the Ordnance Demolition Area - As Collected (Page 2 of 2)
Fort George G. Meade, Site Inspection Addendum

TYPE OF SAMPLE	SITE ID	FIELD ID	DATE	SITE TYPE	MEDIA CODE	N/E (1)	DEPTH	TCL SVOCs	TCL VOCs	PHC	TAL FMET	TAL UMET	TCLP ORG/ MET	PCB	EXP	Cl	NO3	TDS	SO4	PEST
GROUND WATER INVESTIGATION																				
Ground Water Samples	ODAMW-1	O1M0001	022693	WELL	CGW	N	ND	1	1	0	1	1	0	0	1	0	0	0	0	0
	ODAMW-2	O1M0002	022493	WELL	CGW	N	ND	1	1	0	1	1	0	0	1	0	0	0	0	0
	ODAMW-3	O1M0003	022693	WELL	CGW	N	ND	1	1	0	1	1	0	0	1	0	0	0	0	0
Field Blanks	93QC-154	Q1XF154	022693	FBLK	CSW	N	NA	1	1	0	1	1	0	0	1	0	0	0	0	0
Rinse Blanks	93QC-254	Q1XR254	022693	RNSW	CSW	N	NA	1	1	0	1	1	0	0	1	0	0	0	0	0

NOTES:

(1) Indicates if sample location is new (N) or existing (E)
IRDMIS Site Type Codes: WELL=water, AHOL=auger hole
FBLK=field blank, RNSW=rinse water, BORE=borehole
IRDMIS Media Codes: CGW=chemical ground water, CSO=chemical soil
CSW=chemical surface water
Depths for ground water samples: UP=upper Patapsco, LP=lower Patapsco,
PX=Patuxent, ND=not determined or unclear
NA - not applicable
Shaded areas indicate changes from the original SOW

TCL VOCs - Volatile Organics, Target Compound List
TCL SVOCs - Semivolatile Organics, Target Compound List
PHC - Petroleum hydrocarbons
TAL FMET - Filtered metals, Target Analyte List
TAL UMET - Unfiltered metals, Target Analyte List
ORG/MET - organics/metals
EXP - Explosives

TDS - Total Dissolved Solids
PEST - Pesticides

TABLE 8-3: Explosives and Metals Data for Soil from the Ordnance Demolition Area
Page 1 of 1

Sample Location ID	ODAMW-1	ODAMW-1	ODAMW-1	ODAMW-2	ODAMW-2	ODAMW-2	ODAMW-3	ODAMW-3	ODAMW-3	ODASB-4	ODASB-4
Field Sample ID	O1B0001A	O1B0001B	O1B0001C	O1B0002A	O1B0002B	O1B0002C	O1B0003A	O1B0003B	O1B0003C	O1B0004A	O1B0004B
Site Type	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE
Start Depth (ft bgs)	0	5	10	0	5	10	0	5	10	0	5
End Depth (ft bgs)	2	7	12	2	7	12	2	7	12	2	7
Media	CSO	CSO	CSO	CSO	CSO	CSO	CSO	CSO	CSO	CSO	CSO
Total/Dissolved	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total
Collection Date	22-Jan-93	22-Jan-93	25-Jan-93	25-Jan-93	25-Jan-93	25-Jan-93	26-Jan-93	26-Jan-93	26-Jan-93	26-Jan-93	26-Jan-93
QC Type											
EXPLOSIVES (ug/g)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METALS (ug/g)											
Aluminum	2990	5110	1290	9860	6060	1910	6920	6430	2780	6820	2750
Arsenic	4.38	--	3.38	6.31	--	--	--	8.28	4.24	3.96	8.76
Barium	9.74	16.8	5.64	21.1	13.3	5.34	39.8	16.4	8.1	49	6.93
Boron	14	16.2	10.8	11.2	15	13.6	9.76	14.4	14.9	12.7	9.49
Calcium	115	66.9	--	150	33.9	-	157	31.2	--	25900	100
Chromium	12	11.4	6.77	14.7	10.5	5.31	19.6	14	7.45	19.4	12.1
Cobalt	--	--	--	--	--	--	--	--	--	4.38	--
Copper	21.7	6.16	3.9	5.26	4.12	--	16.5	5.5	4.54	47.1	6.26
Iron	9780	3990	4510	7410	7090	3500	8110	10400	4770	12700	8850
Lead	5.15	2.98	1.68	5.73	2.29	1.52	5.47	3.32	2.09	260	2.77
Magnesium	138	150	28.3	445	355	58.8	337	182	69.9	5830	85.7
Manganese	16.9	--	--	19	16.9	--	22	--	--	155	--
Mercury	--	--	--	--	--	--	--	--	--	0.95	--
Nickel	--	--	--	--	--	--	--	--	--	11.1	--
Potassium	211	416	--	605	420	--	405	467	177	851	227
Sodium	--	--	--	--	--	--	--	--	--	132	--
Tin	--	--	--	--	--	--	--	--	--	98.3	--
Vanadium	22.5	13.6	19	22.2	17	11.7	19.8	22.3	14.4	22.7	22.1
Zinc	11.6	6.74	--	11.1	6.12	--	14.9	4.51	--	72.9	3.83
HEAVY METALS	22	14	12	27	13	7	25	26	14	295	24
TOTAL METALS	13352	9807	5879	18587	14044	5506	16077	17599	7853	52990	12085

NOTES:
Heavy metals includes Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag
Dashes indicate that no standard exists (e.g. MCL or SMCL/MCLG) or that the analyte is present below detection limits
Only detected analytes are included on this table, for full data set see appropriate appendix
ND indicates that no compounds were detected in this class

TABLE 8-4: Field Screening, Explosives and Metals Data for Ground Water from the Ordnance Demolition Area
Page 1 of 1

Sample Location Identification			ODAMW-1	ODAMW-1	ODAMW-2	ODAMW-2	ODAMW-3	ODAMW-3
Field Sample ID			01M0001Y	01M0001Z	01M0002Y	01M0002Z	01M0003Y	01M0003Z
Site Type			WELL	WELL	WELL	WELL	WELL	WELL
Screen Start Depth (ft bgs)			3.5	3.5	4	4	5	5
Screen End Depth (ft bgs)			13.5	13.5	14	14	15	15
Media			CGW	CGW	CGW	CGW	CGW	CGW
Total/Dissolved			Total	Dissolved	Total	Dissolved	Total	Dissolved
Collection Date			26-Feb-93	26-Feb-93	24-Feb-93	24-Feb-93	26-Feb-93	26-Feb-93
QC Type								
FIELD PARAMETERS								
pH			4.69		4.19		4.71	
Conductivity(umhos/cm2)			0.112		0.108		0.059	
Temperature(C)			7.3		7.2		8.9	
Turbidity(NTU)			365		0		436	
EXPLOSIVES (ug/L)	**HA**							
HMX	400		3.57		9.13		--	
RDX	2		33.5 *		84 *		--	
2,4-Dinitrotoluene	--		0.599		0.615		--	
METALS (ug/L)	**MCL**	**SMCL/MCLG**						
Aluminum	--	50-200 S	1,970	580	11,800	505	9,720	117
Arsenic	50	--	2.77	--	4.64	--	5.95	--
Barium	2,000	-- G	78	81.8	104	88.1	88.7	58.2
Cadmium	5	-- G	7.45 *	9.01 *	--	--	--	--
Calcium	--	--	7,420	9,520	6,480	8,170	2,040	1,970
Chromium	100	-- G	--	--	52.7	--	42	--
Copper	1,300	1,000 G/S	--	--	30.4	--	25.4	--
Iron	--	300 S	8,960	--	29,800	--	34,000	--
Lead	15	--	--	--	6.54	--	6.47	--
Magnesium	--	--	3,790	4,340	4,310	5,070	3,090	2,680
Manganese	--	50 S	218	270	243	284	163	138
Potassium	--	--	1,630	2,150	2,550	1,690	2,030	1,660
Selenium	50	-- G	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--
Sodium	--	--	3,150	3,490	2,340	3,480	2,460	2,460
Vanadium	--	--	--	--	82	--	61.9	--
Zinc	--	5,000 S	76.6	109	66.4	49.8	45.9	35.3
Total Heavy Metals			10	9	64	0	54	0
Total Metals			27,303	20,550	57,870	19,337	53,779	9,119

NOTES:
Heavy Metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag
Lead has an action level of 15 ug/L and copper has an action level of 1300 ug/L
MCLs = maximum contaminant levels; S = secondary MCLs (SMCLs); G = MCL goals (MCLG); HA = health advisory (explosives only)
Dashes indicate that no standard exists or that the analyte is present below detection limits
Asterisks (*) indicate analytes present above primary standards (e.g., MCL, maximum AWQC)
Only detected analytes are included on this table, for full data set see appropriate appendix

Table 8-5: Organic Compounds in Ground Water from the Ordnance Demolition Area

Sample Location Identification			ODAMW-1	ODAMW-2	ODAMW-3
Field Sample ID			O1M0001	O1M0002	O1M0003
Site Type			WELL	WELL	WELL
Screen Start Depth (ft bgs)			3.5	4	5
Screen End Depth (ft bgs)			13.5	14	15
Media			CGW	CGW	CGW
Total/Dissolved			Total	Total	Total
Collection Date			26-Feb-93	24-Feb-93	26-Feb-93
QC Type					
VOLATILE ORGANIC COMPOUNDS (ug/L)	**MCL**	**SMCL/MCLG**			
HALOGENATED VOCs					
Trichloroethene	5	0 G	–	–	2.6
Tetrachloroethene	5	0 G	5.6 *	4.5	10 *
Total VOC			6	5	13
SEMIVOLATILE ORGANIC COMPOUNDS			ND	ND	ND

NOTES:
MCLs = maximum contaminant levels; S = secondary MCLs (SMCLs); G = MCL goals (MCLG)
Dashes indicate that no standard exists (e.g. MCL or SMCL/MCLG) or that the analyte is present below detection limits
Only detected analytes are included on this table, for full data set see appropriate appendix
ND indicates that no compounds were detected in this class
Asterisks (*) indicate analytes present above primary standards (e.g., MCL, maximum AWQC)

9.0 Soldiers Lake

9.1 Introduction and Background

Soldiers Lake, now called Allen Lake, is located on the BRAC parcel approximately one-mile west of the ASL. The man-made lake is approximately 20 acres in size and up to 12 feet in depth.

Soldiers Lake is located in the Little Patuxent Watershed. The lake is fed by the Range Harbor Branch which is formed, north of Route 32, by the confluence of the Midway and Franklin Branches of the Little Patuxent River. The rivers flow southward while draining the majority of the base north of Route 32. The Franklin Branch flows through Burba Lake prior to reaching its confluence.

The outflow from Soldiers Lake flows south and is joined by an unnamed tributary that flows through and adjacent to the ASL. The combined flow joins the Little Patuxent River outside the boundary of the BRAC parcel.

Surface water and sediment samples were collected from Soldiers Lake during the SI (EA Engineering, Science and Technology, 1992b). Two locations were sampled, one in the central area of the lake and one near the southern discharge. The surface water samples were found to contain low levels of pesticides (the maximum concentration for an individual pesticide was 0.041 μg/L for heptachlor), but no VOC or SVOCs. Eight metals were detected in both surface water samples but none were detected above their AWQC. Three metals, cadmium, chromium, and copper, had detection limits slightly above the AWQC, but the gap between the detection limits and AWQC was less than 7 μg/L.

USAEC-certified methods were used as the basis of the analytical work for this program. The precision and accuracy of these methods is determined over a four-day period with the preparation and analysis of standard matrix-spiked samples. The concentration spiked versus the concentration found for the QC spikes are plotted and the certified reporting limit (CRL) is statistically calculated. The CRLs of the USAEC-certified methods for DataChem Laboratories for cadmium, chromium, and copper are given in the table below. The corresponding MCLs and AWQCs are also listed.

Metal	CRL (µg/L)	MCL (µg/L)	AWQC (µg/L)
Cadmium	6.78	5	1.1
Chromium	16.8	100	210
Copper	18.8	1300	12

The scope of work for this SIA was to evaluate human health risk, therefore, the MCLs were used to determine the acceptability of the laboratory's detection limits. Although the cadmium CRL is above the MCL by 1.78 µg/L, it was accepted after reviewing the Soldiers' Lake Sediment Inorganic Data (EA Engineering, Science, and Technology, Inc., January 1992) that found < 1.2 µg/g of cadmium in the sediment, which is below ER-L standard for cadmium in sediment of 5 µg/g. If cadmium was present in the lake water, it would have evidenced itself in elevated sediment concentrations.

Pesticides (maximum detected concentration was 0.30 µg/g of chlordane) were also detected in sediments. No VOCs were detected in either sample but two SVOCs (fluoranthene and pyrene) were detected in the southern sample. Seventeen metals were detected. Metal concentrations were higher in the northern sample than in the southern sample.

9.2 Summary of Investigation for Study Area

The purpose of the SIA field investigation for Soldiers Lake was to confirm the presence of previously detected analytes in surface water by resampling in this area. The chemistry is compared to the historic data. The tasks conducted to achieve this objective included:

- Collection of two surface water samples.

Table 9-1 summarizes the laboratory samples collected at Soldiers Lake including site IDs, site types, media codes, and analytical parameters. Figure 9-1 illustrates the sample locations and site layout.

9.3 Physical Characterization of the Study Area

Soldiers Lake is located in a wooded area of the BRAC parcel. The banks of the lake are generally grassy. The lake is surrounded by access roads with a small spillway at the southern end. A bridge crosses the spillway.

The lake is divided into two sections by a strip of land near sample location SLSW-1. The land constricts lake flow into a channel which is approximately 50 feet wide. Approximately 5-inches of ice were present in this area during the sampling. The area by the spillway was not frozen and had a total depth of approximately 2 feet.

9.4 Nature and Extent of Contamination

During the SIA, surface water samples were collected to evaluate changes in water chemistry from the previous sampling round. The resulting data are discussed below. The data tables in this section provide a summary of the detected analytes. A complete summary of the data can be found in Appendix M.

Field Screening Readings: During the sampling process, field measurement were made of the surface water for pH, conductivity, temperature and turbidity. The field parameters are indicative of general water quality and are included in Table 9-2. For surface water, pH ranged from 5.83 to 6.54. Conductivity ranged from 0.342 to 0.716 $\mu mhos/cm^2$. Temperature ranged from -1.0 to 3.7° C. Turbidity ranged from 8 to 16 NTUs. None of the measurements were outside of the expected range; no trends were observed.

Metals: Metals are naturally occurring elements and are commonly found in ground and surface water. The surface water samples were analyzed for 27 metals, of which 9 were detected: aluminum, barium, calcium, iron, potassium, manganese, magnesium, sodium, and zinc. The detected metals are summarized on Table 9-2. Zinc is the only one of the detected metals with an AWQC. Zinc concentrations in the samples were below both the continuous and maximum AWQC.

The same nine metals were detected in surface water during the SI sampling round. In both data sets, higher concentrations of metals are generally found in the sample collected by the spillway. Seven metals were detected at higher concentrations in the SIA, but only one concentrations increased by more than 50 percent. Sodium tripled from SI to the SIA maximum concentrations. In the winter, when road salt is commonly used, sodium concentrations often increase in surface water. The increase of sodium in Soldiers Lake most likely reflect that the SI samples were collected in April and the SIA samples were collected in January.

Pesticides: Low concentrations of pesticides have been detected in the past in multiple media and locations at FGGM, therefore, the surface water samples were analyzed for pesticides. The samples were analyzed for 18 pesticides of which three were detected: isodrin, lindane and PPDDT. The highest individual concentration was

0.008 μg/L of lindane in sample SLSW-1. Total pesticide concentrations range from 0.011 μg/L to 0.017 μg/L.

During the SI, seven pesticides were detected with a maximum individual concentration of 0.041 μg/L of heptachlor in SW-23. The total pesticide concentration for the SI (EA Engineering, Science and Technology, 1992b) was 0.113 μg/L, approximately an order of magnitude higher than the total pesticide concentration in the SIA. The data may indicate that the pesticide concentrations have decreased between 1991 and 1994 or that the pesticide concentrations change seasonally dependent upon pesticide use.

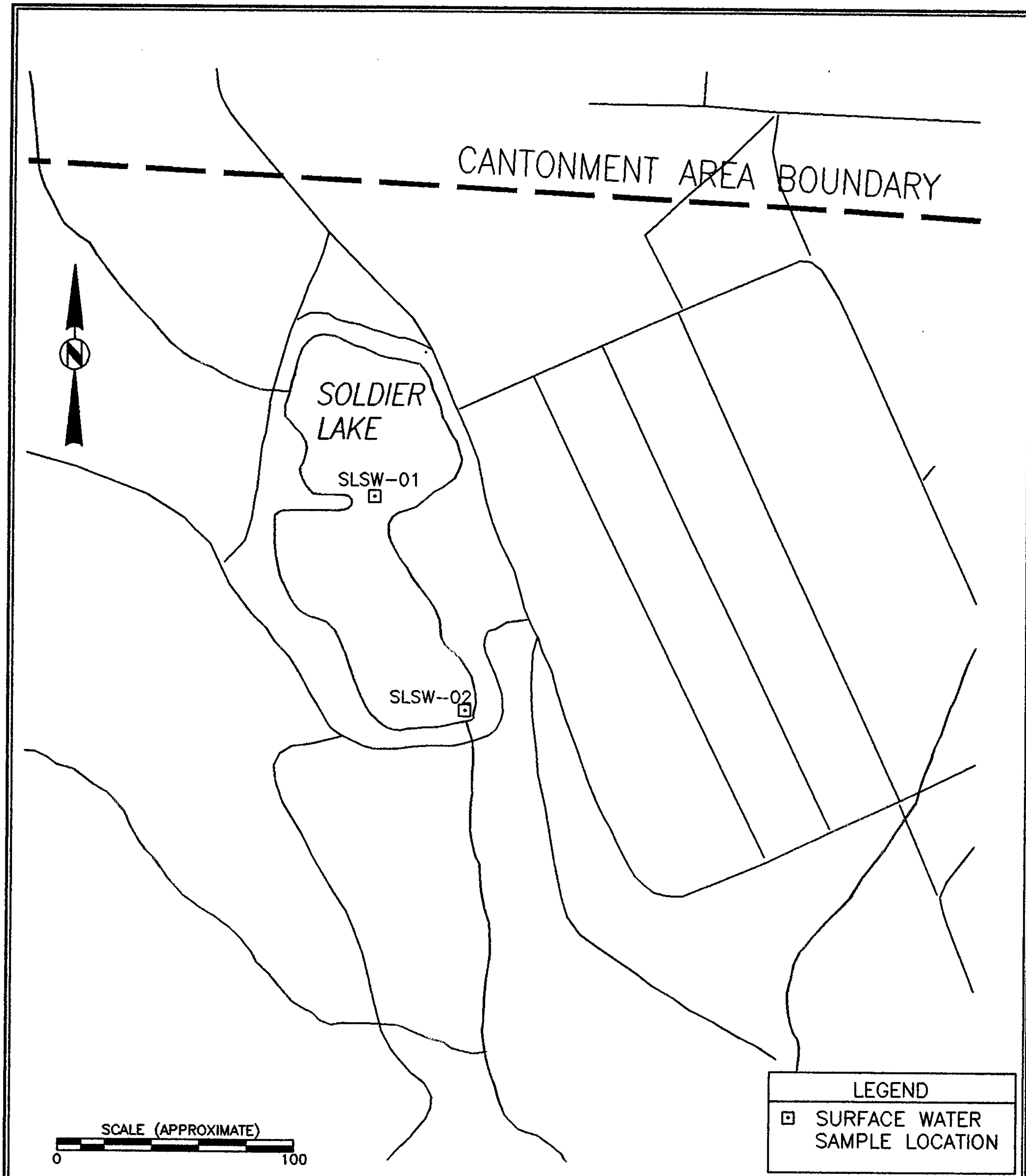
9.5 Contaminant Assessment

In general, the data collected in the SIA were in agreement with the SI data. The same metals were detected at generally comparable concentrations. No AWQC were exceeded by the detected metals, therefore, it is unlikely that the metal concentrations have an detrimental impact on lake ecology.

The pesticide concentrations may have decreased slightly, however, changes in chemistry may be attributed to seasonal variations. The pesticide concentrations are typical of those detected in other media at FGGM.

9.6 Data Gaps and Recommendations

Based on historical and recent data, no future action is proposed for this area.



PREPARED FOR: USAEC	SOURCE: USAEC 1992	TITLE: FIGURE 9-1: SOLDIER'S LAKE SITE LAYOUT AND SAMPLING LOCATIONS
DATE: MAR. 1994 — DWG. NO.: 67069053		
SCALE: AS SHOWN	Arthur D Little	

Table 9-1 Summary of Laboratory Samples for Soldier's Lake - As Collected
Fort George G. Meade, Site Inspection Addendum

TYPE OF SAMPLE	SITE ID	FIELD ID	DATE	SITE TYPE	MEDIA CODE	N/E	DEPTH	TCL SVOC	TCL VOCs	PHC	TAL FMET	TAL UMET	TCLP ORG/ MET	PCB	EXP	Cl	NO3	TDS	SO4	PEST
Background Soils	BKG-24	B1A0024	011994	AHOL	CSO	N	2-3 FT	0	0	0	0	1	0	0	0	0	0	0	0	1
	BKG-25	B1A0025	011994	AHOL	CSO	N	2-3 FT	0	0	0	0	1	0	0	0	0	0	0	0	1
	BKG-26	B1A0026	011994	AHOL	CSO	N	2-3 FT	0	0	0	0	1	0	0	0	0	0	0	0	1
SURFACE WATER INVESTIGATION																				
Surface Water Samples	SLSW-1	S1K0001	011994	LAKE	CSW	N	NA	0	0	0	1	1	0	0	0	0	0	0	0	1
	SLSW-2	S1K0002	011894	LAKE	CSW	N	NA	0	0	0	1	1	0	0	0	0	0	0	0	1
Duplicates	94QC-455 (dup of SLSW-2)	Q1KD455	011894	LAKE	CSW	N	NA	0	0	0	1	1	0	0	0	0	0	0	0	1
Field Blanks	94QC-158	Q1XF158	011894	FBLK	CSW	N	NA	0	0	0	0	1	0	0	0	0	0	0	0	1

NOTES:

N/E indicates if sample location is new (N) or existing (E)
IRDMIS Site Type Codes: WELL=water, AHOL=auger hole, STRM=stream
OTFL=outfall, LAKE=lake, FBLK=field blank, RNSW=rinse water
IRDMIS Media Codes: CGW=chemical ground water, CSO=chemical soil
CSW=chemical surface water, CSE=chemical sediment
Depths for ground water samples: UP=upper Patapsco, LP=lower Patapsco,
PX=Patuxent, ND=not determined or unclear; NA-not applicable

TCL, VOCs - Volatile Organics, Target Compound List
TCL, SVOCs - Semivolatile Organics, Target Compound List
PHC - Petroleum hydrocarbons
TAL FMET - Filtered metals, Target Analyte List
TAL UMET - Unfiltered metals, Target Analyte List
ORG/MET - organics/metals
EXP - Explosives

TDS - Total Dissolved Solids
PEST - Pesticides

TABLE 9-2: Metals and Pesticides in Surface Water from Soldiers Lake
Page 1 of 1

Site ID			SLSW-1	SLSW-2	94QC-455
Field Sample ID			S1K0001Y	S1K0002Y	Q1KD455Y
Site Type			LAKE	LAKE	LAKE
Start Depth (ft)			0	0	0
End Depth (ft)			0.5	0.5	0.5
Media			CSW	CSW	CSW
Collection Date			19-Jan-94	18-Jan-94	18-Jan-94
Total/Dissolved			Total	Total	Total
QC Type					Dup. of SLSW-2
FIELD PARAMETERS					
pH			6.54	5.83	
Conductivity (umho/cm2)			0.716	0.342	
Temperature (C)			-1.0	3.7	
Turbidity (NTU)			8	16	
	AWQC MAX	**CONT**			
METALS (ug/L)					
Aluminum	–	–	119	143	152
Barium	–	–	68	58.1	58.5
Calcium	–	–	22,800	19,600	19,200
Iron	–	–	502	498	501
Magnesium	–	–	5,150	4,360	4,330
Manganese	–	–	120	114	112
Potassium	–	–	3,610	3,320	2,560
Sodium	–	–	93,000	44,900	43,300
Zinc	120	110	32.9	25.9	29
HEAVY METALS			**0**	**0**	**0**
TOTAL METALS			**125,402**	**73,019**	**70,243**
PESTICIDES (ug/L)					
Lindane	–	–	0.008	0.006	0.006
Isodrin	–	–	0.003	0.006	0.005
p,p'-DDT	–	–	–	0.005	0.004
TOTAL PESTICIDES			**0.011**	**0.017**	**0.015**

NOTES:
Only detected analytes are included on this table, for full data set see the appropriate appendix
AWQC - ambient water quality criteria, MAX - maximum, CONT - continuous
Dashes (--) indicate that no standard (e.g., MCL, SMCL, MCLG) exists or that the analyte is present below detection limits
Heavy metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag

10.0 References

Argonne National Laboratory. October 1989. *Enhanced Preliminary Assessment Report, Fort Meade, Maryland.*

Army Corp of Engineers, October 1, 1990. *Chemical Data Quality Management for Hazardous Waste Remedial Activities.* ER 1110-1-263.

Arthur D. Little, Inc. May 1993a. *Management Resource Plan for Fort Meade, Maryland.*

Arthur D. Little, Inc. November 1993b. *Health and Safety Plan for Fort Meade, Maryland.*

Arthur D. Little, Inc. November 1993c. *Quality Control Plan (QCP) for Fort Meade, Maryland.*

Arthur D. Little, Inc. November 1993d. *Work Plan for Fort Meade, Maryland.*

Defense Mapping Agency Hydrographic/Topographic Center, Washington, DC. 1976. Fort Meade.

EA Engineering, Science and Technology, Inc. September 1990. *Final Technical and Sampling/Analysis Plan for Fort Meade Base Closure Parcel Site Inspection and Phase II Remedial Investigation Studies.*

EA Engineering, Science and Technology, Inc. January 1991. *Final Quality Assurance Plan for Fort Meade Base Closure Parcel Site Inspection and Phase II Remedial Investigation Studies.*

EA Engineering, Science and Technology, Inc. October 1992a. *Final Fort George G. Meade, Active Sanitary Landfill and Clean Fill Dump, Remedial Investigation Reports.*

EA Engineering, Science and Technology, Inc. October 1992b. *Final Fort George G. Meade, Base Closure Parcel Site Inspection Study.*

Glaser, John D., Editor. 1976. *Anne Arundel County: Geology, Mineral Resources, Land Modification, and Shoreline Conditions.* Maryland Geological Survey, County Atlas No. 1.

Hansen, Harry J. and Jonathan Edwards, Jr. 1986. *The Lithology and Distribution of Pre-Cretaceous Basement Rocks Beneath the Maryland Coastal Plain.* Report of Investigations No. 44, Maryland Geological Survey.

Hem, John D. 1985. *Study and Interpretation of the Chemical Characteristics of Natural Water.* USGS Water Supply Paper 2254.

Hunter/Environmental Science & Engineering, Inc. September 1990. *Public Involvement and Response Plan for Fort George G. Meade, Maryland.*

Long, E. R. and L. G. Morgan. August 1991. *The Potential for Biological Effects on Sediment-Sorbed Contaminants Tested in the National Status and Trends Program.* National Oceanographic and Atmospheric Administration. Seattle WA. NOS OMA 52.

Mack, Frederick K. 1962. *Ground-Water Supplies for Industrial and Urban Development, In Anne Arundel County.* State of Maryland. Bulletin 26.

Mack, Frederick K. 1962. *Ground-Water Supplies for Industrial and Urban Development in Anne Arundel Country.* Maryland Geological Survey, Bulletin 26.

Mack, Frederick K. and Grufron Achmad. 1986. *Evaluation of the Water-Supply Potential of Aquifers in the Potomac Group of Anne Arundel Country, Maryland.* Maryland Geological Survey, Report of Investigations No. 46.

Maryland Department of the Environment. July 1, 1991. *Code of Maryland Regulations 26.08.02 Water Quality.*

Maryland Department of the Environment. 1991. *Code of Maryland Regulations 26.04 Regulation of Water Supply, Sewage Disposal and Solid Waste.*

Maryland Department of Natural Resources. January 1990. Capital Programs Administration, Land Planning Services. *Evaluation of Fort George G. Meade Surplus Property.*

Maryland Geological Survey. 1968. *Geologic Map of Maryland.*

RGH/CH2M Hill Inc. January 1991. *Wetland Identification at Fort Meade, Maryland.*

National Weather Service. April 1994. *Personal Communication.*

Sax, N. Irving and Richard Lewis, Sr. 1987. *Hawley's Condensed Chemical Dictionary.*

U.S. Army Corp of Engineers (USACE), Baltimore District. August 1991. *Final Environmental Impact Statement. Comprehensive Base Realignment and Partial Closure for Fort George G. Meade and Fort Holabird.*

U.S. Army Corp of Engineers (USACE), Baltimore District. 1990. *Draft Environmental Impact Statement. Comprehensive Base Realignment and Partial Closure for Fort George G. Meade and Fort Holabird.*

U.S. Army Environmental Center (USAEC) and U.S. Army Environmental Hygiene Agency. March 1993. *Explosives Information Briefing.*

U.S. Army Environmental Hygiene Agency, Defense Revitalization and Marketing Office, Fort George G. Meade, Maryland. October 21-25, 1991. *Preconstruction Study #37-26-J-182-92.*

U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). March 1987. *Geotechnical Requirements for Drilling, Monitor Wells, Data Acquisition, and Reports.*

U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). January 1990. *Quality Assurance Program.*

U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). June 15, 1992. *Preliminary Hazard Ranking System Score for the Sanitary Landfill and Clean Fill Dump at Ft. Meade, Maryland.*

U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). August 1992. Request for Quotation *Fort Meade Feasibility Study (FS), and Remedial Investigation/Site Inspection (RI/SI) Addendum.*

U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). 1992. *Preliminary Hazard Ranking System Score for the Sanitary Landfill and Clean Fill Dump at Ft. Meade, Maryland.*

U.S. Department of Health and Human Services. 1985. *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities.*

U.S. Environmental Protection Agency (US EPA), (540/P-91/001). *Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites.*

U.S. Environmental Protection Agency (US EPA). 1986. *Test Methods for Evaluating Solid Waste.* SW846 Third Edition and Revisions/Updates.

U.S. Environmental Protection Agency (EPA). 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA.* (Interim Report (Final)). EPA/540/G-89-004, October.

U.S. Environmental Protection Agency (US EPA). December 22, 1992. *Water Quality Standard, 40 CFR Part 131.*

U.S. Geological Survey (USGS). 1979. Laurel, Maryland Topographic Quadrangle.

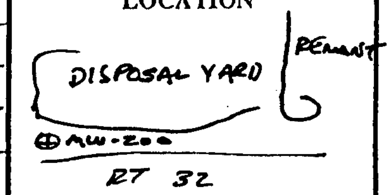
U.S. Geological Survey (USGS). 1979. Odenton, Maryland Topographic Quadrangle.

Appendix A: DPDO Salvage Yard and Transformer Storage Field Forms (DPDO currently known as DRMO)

Appendix A-1: DPDO Salvage Yard and Transformer Storage Soil Boring and Monitoring Well Installation Logs (DPDO currently known as DRMO)

Artlur D Little	Soil Boring Log	Boring No. DPDO MW-200 Client USAEC Project FT. MEADE Case No. 67069

Date Start 1/27/93	Contractor ATEC	LOCATION
Date Complete 1/27/93	Drill Method HOLLOW STEM AUGER	
Hole Diameter 1.1'	Type Of Rig MOBILE DRILL B-57	
Casing Size 6" H.S. AUGER	Drilling Additives NONE	
Boring Depth	Geologist O. NAUGHTON	



Sampling Method HAND AUGER OR 2"x2' SPLIT SPOON, 140 lb HAMMER, 30" DROP

Scale in Feet	SAMPLE Type and number	SAMPLE Interval	SAMPLE Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
0.0–2.0	SS01 1200	0.0-2.0'	2.0' COMPOSITE	HAND AUGERED	0.1	0.0-0.8' [SM] TOPSOIL - SAND WITH SILT, MEDIUM AND FINE SAND, LOOSE, DRY, WELL SORTED DARK YELLOWISH BROWN 10YR 4/2 0.8-2.0' [SP] WELL SORTED MEDIUM SAND, ROUNDED LOOSE, DRY, LIGHT BROWN 5YR 5/6
2.0–5.0						
5.0–7.0	SS02 1205	5.0-7.0	2.0' COMPOSITE	HAND AUGER	0.0	~~[SP]~~ [SW] WELL SORTED, ROUNDED MEDIUM SAND, LOOSE AND DRY LIGHT BROWN 5YR 5/6
7.0–10.0						
10.0–12.0	SS03 1210	10.0-12.0	1.7'	4 17 44 56	1.2	[SW] WELL SORTED, SUBROUNDED MEDIUM SAND, INCREASING TO DENSE 11.0-12.0, DRY, LIGHT BROWN 5YR 5/6
12.0–13.0						

Arthur D Little	Soil Boring Log Continuation Page	Boring No. DPDO MW-200 Client USAEC Project FT MEADE Case No. 67069

Scale in Feet	SAMPLE Type and number	Interval	Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
13.0						
14.0						
15.0						
16.0	SS04 1215	15.0-17.0	1.5'	4 26 54 85	1.2	[SW] LIGHT BROWN 5YR 5/6, MEDIUM SAND, WELL SORTED (NO FINES), DRY, DENSE
17.0						
18.0						
19.0						
20.0						
21.0	SS05 1220	20-22'	1.3'	3 6 9 22	1.5	[SW] LIGHT BROWN 5YR 5/6, MEDIUM SAND, WELL SORTED (NO FINES), DRY, LOOSE [CL] 21.2-22.0 VERY PALE ORANGE 10YR 8/2, SILT WITH SOME FINE SAND, MOIST, MEDIUM STIFF
22.0						
23.0						
24.0						
25.0						
26.0	SS06 1235	25-27'	1.6'	4 21 68 75	2.4	[SW] LIGHT BROWN 5YR 5/6, MEDIUM SAND, WELL SORTED, DRY, DENSE
27.0						
28.0						
29.0						

Artlur D Little

Soil Boring Log
Continuation Page

Boring No. DPDO MW-200
Client USAEC
Project FT MEADE
Case No. 67069

Scale in Feet	SAMPLE Type and number	Interval	Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
29.0						
30.0	SS07 1245	30-32'	1.5'	3 11 58 58	2.3	[SW] PALE GRAYISH ORANGE 10YR 7/4, MEDIUM SAND, SUB-ROUNDED, WELL SORTED, DENSE, DRY
31.0						
32.0						
33.0						
34.0						
35.0	SS08 1315	35-37'	1.8'	6 34 69 84	4.2	[SW] PALE GRAYISH ORANGE 10YR 7/4, MEDIUM AND FINE SANDS, SUB ROUNDED, WELL SORTED, DENSE, DRY.
36.0						
37.0						
38.0						
39.0						
40.0	SS09 1340	40-42'	1.0'	5 13 18 11	2.9	[SW] SAME AS ABOVE, MEDIUM DENSITY
41.0						
42.0						
43.0						
44.0						
45.0						

M

Arthur D Little	**Soil Boring Log** **Continuation Page**	Boring No. DPDO MW-200 Client USAEC Project FT MEADE Case No. 67069

Scale in Feet	SAMPLE Type and number	Interval	Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
45.0–47.0	SS10 1355	45-47'	1.4'	3 18 34 53	1.4	[SW] PALE GRAYISH ORANGE 10YR 7/4, FINE TO MEDIUM SAND, WELL SORTED, SUB-ROUND TO ROUND, MEDIUM DENSITY, NO FINES, DRY.
47.0–50.0						
50.0–52.0	SS11 1510	50-52'	1.5'	5 14 11 13	0.9	[SW] PALE GRAYISH ORANGE 10YR 7/4, FINE TO MEDIUM SAND, WELL SORTED, SUB-ROUND, LOOSE 51-52 [SM] LIGHT BROWN 5YR 5/6 FINE SAND WITH SILT, WELL SORTED, LOOSE, MOIST
52.0–55.0						
55.0–57.0	SS12 1520	55-57	1.9'	7 10 16 24	1.2	[SM] LIGHT BROWN 5YR 5/6, FINE SAND WITH SILT, WELL SORTED, SUB-ROUND, LOOSE, MOIST
57.0–60.0						
60.0–61.0	SS13	60-62	1.7'	8 22 36 68	.4	[CL] PALE YELLOWISH BROWN 10YR 6/2, SILT WITH CLAY AND FINE SAND, LOW MOISTURE ~~#~~ STIFF

Arthur D Little

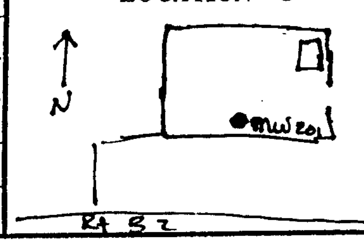
Soil Boring Log

Boring No.	BSY MW 201
Client	USAEC
Project	Ft. Meade
Case No.	

Date Start	Feb. 2, 1993	Contractor	ATEC
Date Complete	2/3/93	Drill Method	Hollow Stem Auger
Hole Diameter	11"	Type Of Rig	Mobile ATV B-53
Casing Size	6"	Drilling Additives	NA
Boring Depth	39'	Geologist	M. Greenwood

Sampling Method 2' steel split spoon driven by 140 lb hammer dropped 30"

LOCATION



Scale in Feet	SAMPLE: Type and number	SAMPLE: Interval	SAMPLE: Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
0.0	SS01	0-2'	1.7	27 26 25 21	0.0	[SW] light brown, well sorted medium grained sand with some gravel in the first 0.6' (rounded), sm. pockets of bituminous-like material, dry medium dense.
1.0						
2.0						
3.0						
4.0						
5.0		5-7'	1'	4 5 6 8	0.0	[SP] Dark yellowish orange 10YR 6/6, poorly sorted medium grained sand, dry, loose compaction
6.0						
7.0						
8.0						
9.0						
10.0		10-12	1.6	10 12 14 12	0.0	[SW] Predominately Dark yellowish orange 10YR 6/6 well sorted very fine sand with zones of very pale orange 10YR 8/2 well sorted fine sand & trace clay. dry, medium dense
11.0						
12.0						
13.0						

Arthur D Little	**Soil Boring Log** Continuation Page	Boring No. DSYMW201 Client USAEC Project Ft. Meade Case No.

Scale in Feet	SAMPLE Type and number	Interval	Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
13.0						
14.0						
15.0	SS04	15-17	1.4	6 13 15 22	0.7	[SP] Dark yellowish orange 10yr 6/6, poorly sorted fine to medium grained sand, dry, medium dense
16.0						
17.0						
18.0						
19.0						
20.0	SS05	20-22	1.6	5 6 6 9	0.0	Same as above with a 0.25' zone of very pale orange 10yr 8/2, clayey silt with trace fine sand.
21.0						
22.0						
23.0						
24.0						
25.0	SS06	25-27	1.9'	5 7 10 39	0.0	0-0.5' very pale orange 10YR 8/2 well sorted sand, fine 0.5-0.8 very pale orange 10yr 8/2 clayey silt with fine sand 0.8-1.1 Dark yellowish orange 10YR 6/6, well sorted fine grained sand 1.1-1.9 -very pale orange 10yr 8/2 clayey silt with fine sand, dry, Loose - Medium Compaction
26.0						
27.0						
28.0						
29.0						

Arthur D Little

Soil Boring Log
Continuation Page

Boring No. DSY MW201
Client USAEC
Project FT. MEADE
Case No.

Scale in Feet	SAMPLE: Type and number	Interval	Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
▽ 29.0						
30.0	SS07	30-32	1.6'	8 17 28 48	0.0	Dark yellowish orange 10YR 6/6, wett as poorly sorted fine to medium sand with a 0.3' zone of very pale orange 10YR 8/2 clayey silt with fine sand, moist [SP-ML] DJV
31.0						
32.0						
33.0						
34.0						
35.0	SS08	35-37	1.3	11 15 11 16	0.1	Dark yellowish orange 10YR 6/6 poorly sorted fine to medium sand with a 0.1' zone of very pale orange 10YR 8/2 clayey silt with fine sand, very moist [SP-ML] DJV
36.0						
37.0						▽ Depth to water was measured 29'
38.0						Depth to the bottom of well was ~~40'~~ 39'
39.0						The screened interval was 36-26'
40.0						The sand filter was to 21' bentonite seal to 15.5'

Artlur D Little

Monitoring Well Design

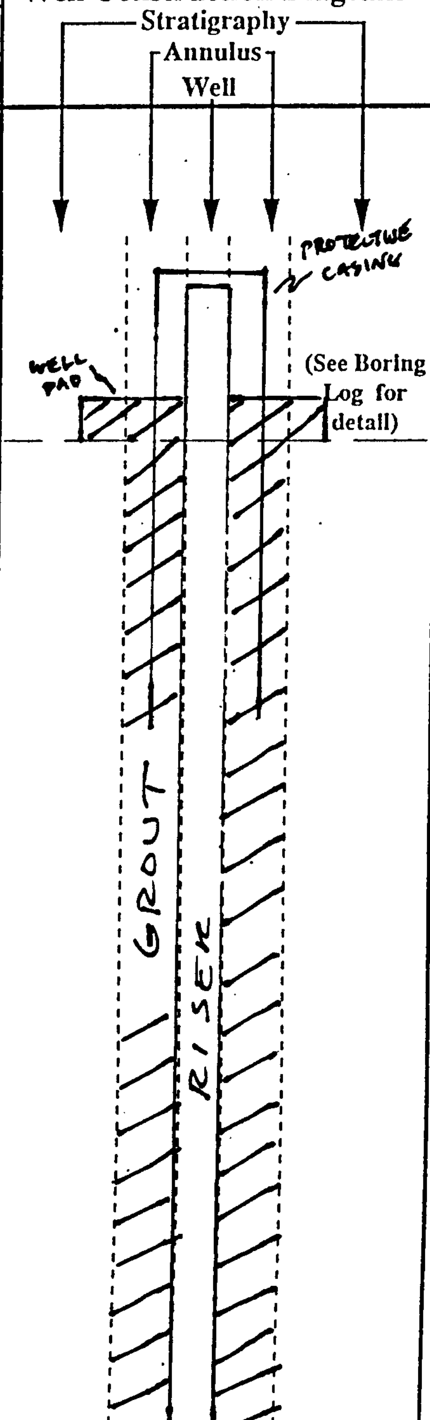
Boring No.	DPDO MW-200
Client	USAEC
Project	FT MEADE
Case No.	67069

Date Start 1/27/97	Date Complete 1/27/93
Hole Diameter 1.1'	Casing Size 6" H.S. AUGER
Contractor ATEL	Geologist G. NAUGHTON
Drill Method HOLLOW STEM AUGER	Boring Depth 60.0'
Type Of Rig MOBILE DRILL B-57	Grout method TREMIED
Datum	Development Method TO BE DEVELOPED

Notes

Scale in Feet	SAMPLE Type and number	SAMPLE Total Organics (ppm)
0.0		
1.0	SS01	0.0
2.0		
3.0		
4.0		
5.0		
6.0	SS02	0.0
7.0		
8.0		
9.0		
10.0		

Well Construction Diagram



Construction Specifications

Elevation Top Of Casing ________

Elevation Top Of Riser Pipe 170.38'

Elevation Ground Surface ________

(surveyed elevations)
(depth from ground surface)

Type of Surface Casing 5' LENGTH HINGE TOPPED
I.D. Surface Casing 6" STEEL PIPE

Type Of Riser Pipe PVC (SCH 40)
I.D. Riser Pipe 4"

Diameter Of Borehole 1.1'

Type Of Backfill GROUT

Type Of Seal BENTONITE CHIPS
Depth To Top Of Seal 35.0'

Type Of Sand Pack ________
Depth To Top Of Sand Pack 41.0'

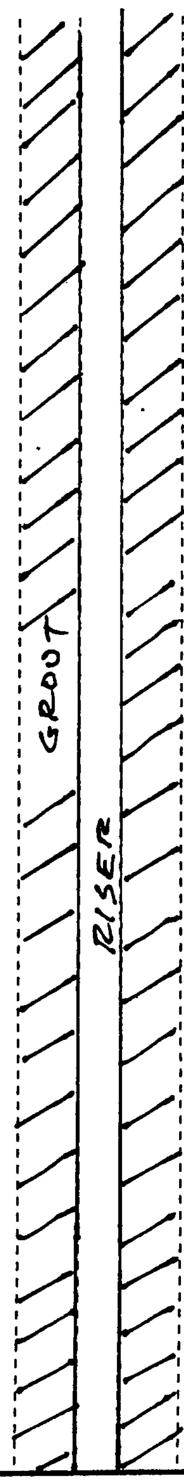
Type Of Screen MACHINE SLOTTED PVC
Slot Size 0.01'
I.D. Screen 4"
Screened Interval 57.0 - 47.0'

Depth To Bottom Of Well 57.0'

Depth To Bottom Of Borehole 60.0'

Arthur D Little	# Monitoring Well Design (Continuation Page)	Boring No. DPDMW-201 Client USAEC Project FT MEADE Case No. 67069

Scale in Feet	SAMPLE Type and number	SAMPLE Total Organics (ppm)	Well Construction Diagram (Stratigraphy / Annulus / Well)	Notes and Comments
10.0	SS03	1.2		
11.0				
12.0				
13.0				
14.0				
15.0	SS04	1.2		
16.0				
17.0				
18.0				
19.0				
20.0	SS05	1.5		
21.0				
22.0				
23.0				
24.0				



Arthur D Little

Monitoring Well Design
(Continuation Page)

g No. DPDO MW-206
t USAEC
roject FT MEADE
Case No. 67069

Scale in Feet	SAMPLE Type and number	SAMPLE Total Organics (ppm)	Well Construction Diagram (Stratigraphy, Annulus, Well)	Notes and Comments
24.0			GROUT / RISER	
25.0	SS06	2.4		
26.0				
27.0				
28.0				
29.0				
30.0	SS07	2.3		
31.0				
32.0				
33.0				
34.0				
35.0	SS08	4.2	BENTONITE CHIPS	
36.0				
37.0				
38.0				

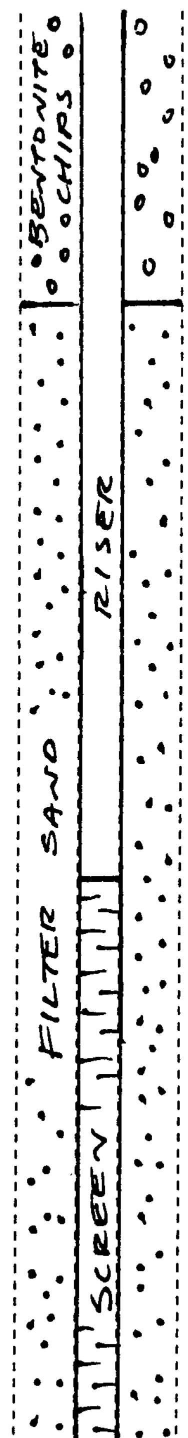
Arthur D Little

Monitoring Well Design
(Continuation Page)

Boring No. DPDO-MW-200
Client USAEC
Project FT MEADE
Case No. 107069

Scale in Feet	SAMPLE Type and number	SAMPLE Total Organics (ppm)
38.0		
39.0		
40.0	SS09	2.9
41.0		
42.0		
43.0		
44.0		
45.0	SS10	1.4
46.0		
47.0		
48.0		
49.0		
50.0	SS11	0.9
51.0		
52.0		

Well Construction Diagram
Stratigraphy
Annulus
Well



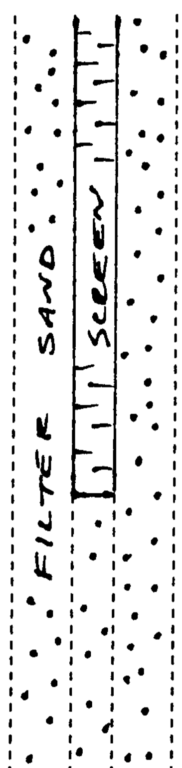
Notes and Comments

Artlur D Little

Monitoring Well Design
(Continuation Page)

Boring No. DPDO MW-20[illegible]
Client USAEC
Project FT MEADE
Case No. 67064

Scale in Feet	SAMPLE: Type and number	SAMPLE: Total Organics (ppm)	Well Construction Diagram (Stratigraphy, Annulus, Well)	Notes and Comments
52.0				
53.0				
54.0				
55.0	SS12	1.2		
56.0				
57.0				
58.0				
59.0				
60.0	SS13	1.4		END OF BOREHOLE
61.0				
62.0				

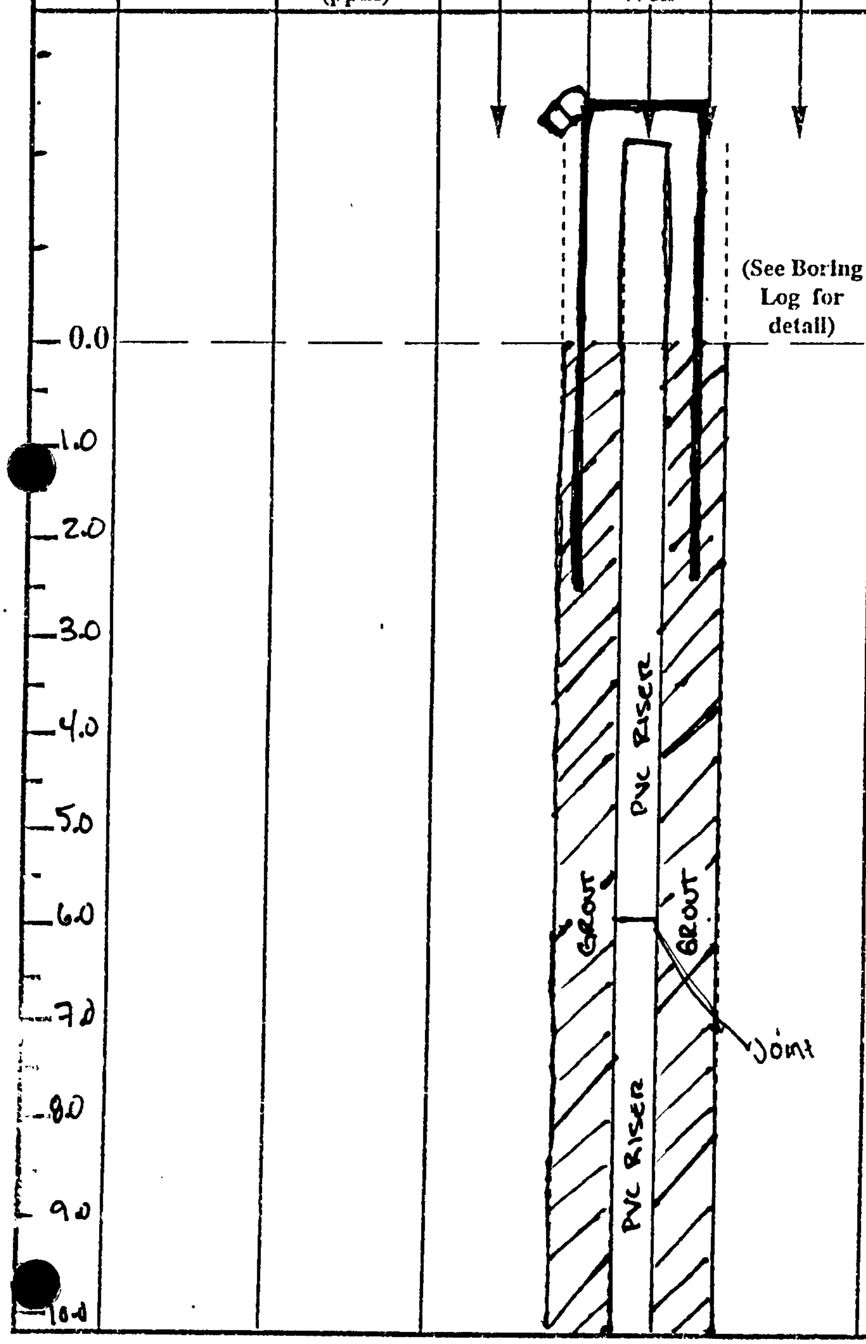


Arthur D Little 3 DJY	**Monitoring Well Design**	Boring No. DSY-MW-201 Client USAEC Project Ft. Meade Case No.

Date Start 2/2/93	Date Complete 2/3/93	Hole Diameter 6 5/8'	Casing Size 4"

Contractor ATEC	Geologist M. Greenwood
Drill Method Hollow Stem Auger	Boring Depth 39'
Type Of Rig Mobile ATV B-53	Grout method
Datum Double notch on PVC riser	Development Method To be developed
Notes	

Scale in Feet	SAMPLE Type and number	SAMPLE Total Organics (ppm)	Well Construction Diagram
0.0 – 10.0			See diagram



Construction Specifications

Elevation Top Of Casing ____________

Elevation Top Of Riser Pipe ____________

Elevation Ground Surface ____________

(surveyed elevations)

(depth from ground surface)

Type of Surface Casing 5' stainless steel Stickup

I.D. Surface Casing 6"

Type Of Riser Pipe PVC

I.D. Riser Pipe 4"

Diameter Of Borehole 6 5/8

Type Of Backfill NA

Type Of Seal Bentonite Chips

Depth To Top Of Seal 15.10'

Type Of Sand Pack Silica Quartz Sand

Depth To Top Of Sand Pack 21'

Type Of Screen PVC

Slot Size 0.010

I.D. Screen 4"

Screened Interval 36-26'

Depth To Bottom Of Well 36'

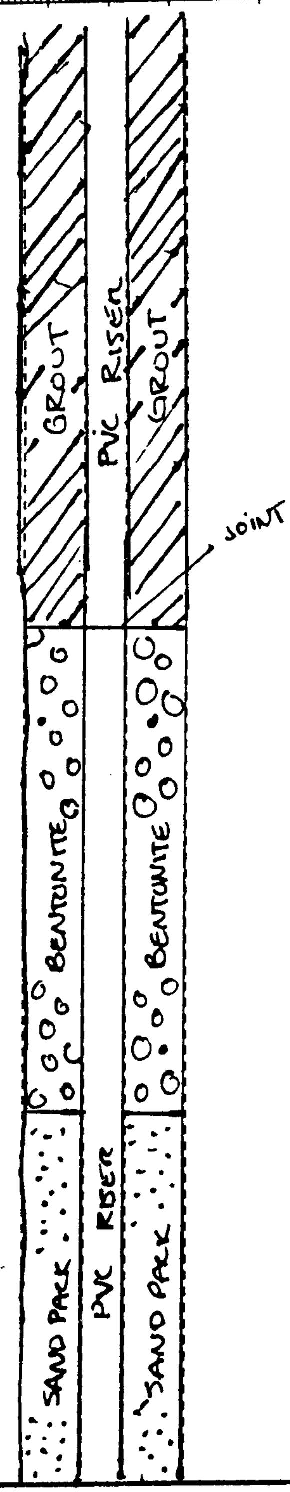
Depth To Bottom Of Borehole 39'

Arthur D Little

Monitoring Well Design
(Continuation Page)

Boring No. DSYMW-201
Client USAEC
Project Ft. Meade
Case No.

Scale in Feet	SAMPLE Type and number	SAMPLE Total Organics (ppm)	Well Construction Diagram (Stratigraphy / Annulus / Well)	Notes and Comments
10.0				
11.0				
12.0				
13.0				
14.0				
15.0				
16.0				
17.0				
18.0				
19.0				
20.0				
21.0				
22.0				
23.0				
24.0				

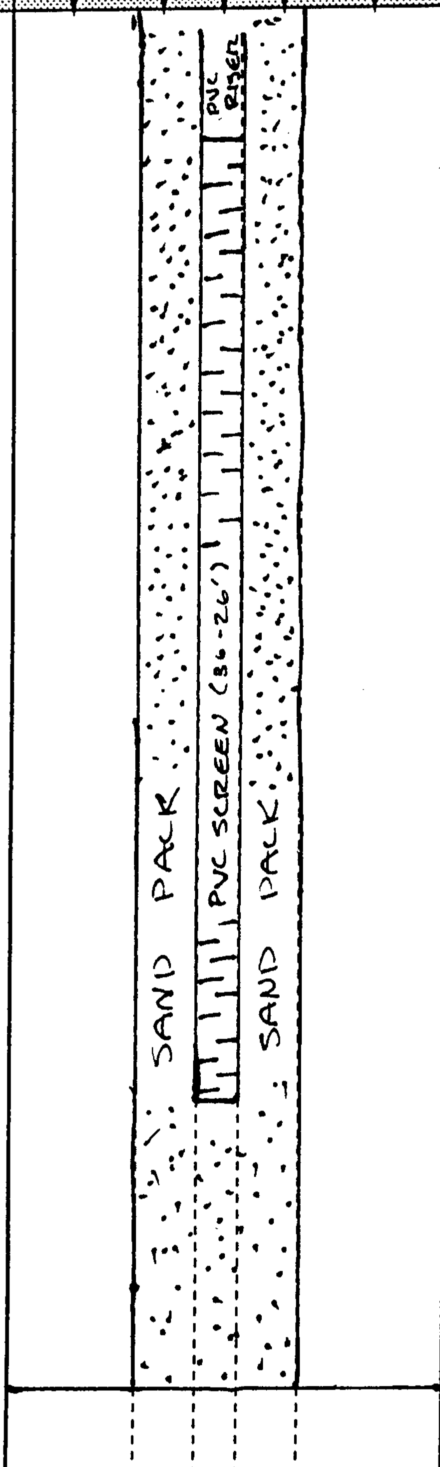


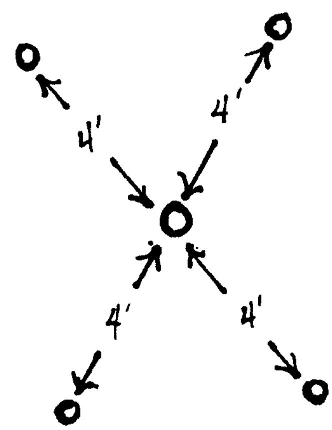
Arthur D Little

Monitoring Well Design
(Continuation Page)

Boring No.	DSV/MW-201
Client	USAEC
Project	Fort Meade
Case No.	

Scale in Feet	SAMPLE: Type and number	SAMPLE: Total Organics (ppm)	Well Construction Diagram (Stratigraphy, Annulus, Well)	Notes and Comments
25.0				
26.0				
27.0				
28.0				
29.0				
30.0				
31.0				Pickets were placed 4' from the PVC riser.
32.0				
33.0				
34.0				
35.0				
36.0				
37.0				
38.0				
.0				





Pickets were placed 4' from the PVC riser.

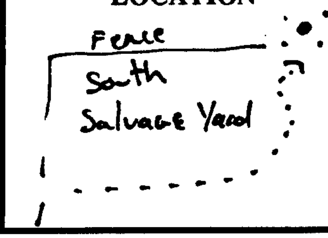
Appendix A-2: DPDO Salvage Yard and Transformer Storage Monitoring Well Development Logs

(DSY)

Arthur D Little	Monitoring Well Development Data Sheet	Well No. MW200
		Client US AEC
		Project Fort Meade
		Case No. 67067

Date Developed: 2/10/93
Developed By: E. FRIEDENSON
Depth to Water: 50.41
Total Depth: 59.5
0^2 19.5 | LEL 0 | HNu 28.4 ppm
Measuring Point: double notch on PVC riser
Notes:

LOCATION



WELL VOLUME (* use appropriate values in table for each code letter)

V well		Depth Screen Bottom		Depth Water		Gallons of Water (well)
.66	x [(	~~56.7~~ ~~56.7~~ 59.5	-	50.41	)] =	5.9994

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annalus		Depth Screen Bottom		Depth Bottom of Seal **		Gallons of Water (annalus)
1.06	x [(	59.5	-	41.0	)] =	19.61

WATER TO BE REMOVED

	Gallons of Water (well)		Gallons of Water (annulus)		Removal Multiplier		Total Gallons to be Removed	Actual Gallons Removed
[(	5.9994	+	19.61	)] x	5	=	128	130

MEASUREMENTS

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
1130	0.0 gallons	9.3	33	13 ~~7.7~~ °F	490
1206	25	5.1	.18	14	996
1227	50	5.0	.17	14	666
1250	75	5.01	.16	14	~~157~~ 10
1311	100	4.92	.153	13.8	10
1337	130	4.94	.148	13.9	10

TABLE

Well		Annalus *	
V well		dia	V annalus
2" 0.17gal/ft		6.5	0.46gal/ft
		7.25	0.59gal/ft
		7.75	0.69gal/ft
		8.25	0.79gal/ft
4" 0.66gal/ft		8.25	0.64gal/ft
		10.25	1.06gal/ft
		12.25	1.63gal/ft
6" 1.5gal/ft		12.25	1.41gal/ft

Depth to Sediment: Before — After —

Type/Capacity of pump KECK

Pumping Rate 1.1 gallons/minute | Recharge Time

Time to Develop Well: Start 1139 Finish 1337 Duration 1hr 58min

COMMENTS (include description of water removed)

water clear at 50 gallons.

1342 After pumping ~~53.45 ft~~ H_2O level at 53.45 ft } 2.5ft/25 mins recharge rate

1407 H_2O Level at 50.95 ft 1414 50.76 ft *

* Assumes 30% porosity for sand pack

* recharge rate initially 0.1 ft/minute. slowed below .01 ft/minute after first 2.5 ft.

** forgot to account for standup → purged extra volume.
DJV

(LDSY)

Arthur D Little

Monitoring Well Development Data Sheet

Well No.	MW-201
Client	USAEC
Project	Fort Meade
Case No.	67067

Date Developed: 2/11/93		Developed By: E. Friedenson	
Depth to Water: 31.48		Total Depth: 41.755	
0^2 20.7	LEL -.3%	HNu .4 ppm	
Measuring Point: black notch on pvc riser at top of riser			
Notes:			

LOCATION

North salvage yard

WELL VOLUME (* use appropriate values in table for each code letter)

V well [.06644] x [([38.38+3.375] - [31.48])] = Gallons of Water (well) [~~41.7~~] 6.78

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annalus 1.06 [~~10.25~~] x [(Depth Screen Bottom [41.755] - Depth Bottom of Seal [21])] = Gallons of Water (annalus) [22.0]

WATER TO BE REMOVED

[(Gallons of Water (well) [~~22.0~~ 6.78] + Gallons of Water (annulus) [22.0])] x Removal Multipier [5] = Total Gallons to be Removed [143.9]

Actual Gallons Removed [145]

MEASUREMENTS

Time	Number of Gallons Removed 0.0 gallons	pH	Conductivity	Temperature	Turbidity
0835		6.77	.532	13.7	999
0950	30	6.80 ~~5.88~~	.216	13.7	984
1132	60	5.82	~~.189~~ .210	13.3	10
1322	90	5.98	.208	14.3	10
~~30~~ 1502	120	5.57	.210	13.6	10
1622	145	5.68	.208	11.9	10

TABLE

Well		Annulus *	
V well		dia	V annulus
2" 0.17gal/ft		6.5 7.25 7.75 8.25	0.46gal/ft 0.59gal/ft 0.69gal/ft 0.79gal/ft
4" 0.66gal/ft		8.25 10.25 12.25	0.64gal/ft 1.06gal/ft 1.63gal/ft
6" 1.5gal/ft		12.25	1.41gal/ft

Depth to Sediment: Before — After —

Type/Capacity of pump KECK

Pumping Rate 145 gallons / 7hrs 37min $\boxed{.31 \text{ gal/min}}$ Recharge Time 3 inches timed to 1 minute 12 seconds

Time to Develop Well: Start 0848 Finish 1625 Duration 7hrs 37min

COMMENTS (include description of water removed)

Pump was shut off for two fifteen-minute intervals to let water recharge.
water first a cloudy orange brown. water clear after 50 gallons.
* did not account for standup → purged extra volume. -EF

12 inches timed to 5 minutes 33 secs

* Assumes 30% porosity for sand pack

Appendix A-3: DPDO Salvage Yard and Transformer Storage Monitoring Well Sampling Logs

Arthur D Little

Monitoring Well Sampling Data Sheet

Well No.	CUE-1
Client	USAEC
Project	FT MEADE
Case No.	67069

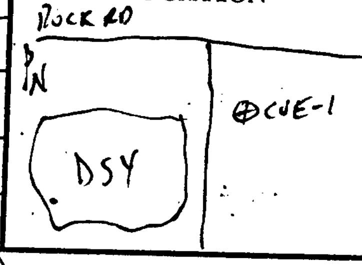
Date Sampled: 2-23-93	Sampled By: WEBBER / COLITHWAITE
Depth to Water: 26.4'	Total Depth: 37.1'

O_2 21.0	LEL 000	PID 0.5

Measuring Point: BLACK MARK TOP OF PVC RISER

Equipment: KECK PUMP, TEFLON BAIL

LOCATION



WELL VOLUME (* use appropriate values in table for each code letter)

V well [0.64] x [(Depth Screen Bottom [37.1] - Depth Water [26.4])] = Gallons of Water (well) [7.1]

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus [1.06] x [(Depth Screen Bottom [37.1] - Depth Bottom of Seal [22.1])] = Gallons of Water (annulus) [15.9]

WATER TO BE REMOVED

[(Gallons of Water (well) [7.1] + Gallons of Water (annulus) [15.9])] x Removal Multipler [5] = Total Gallons to be Removed [115]

Actual Gallons Removed [115]

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
1230	0	4.43	.263	10.4	>999
1400	115	4.33	.196	12.9	5
Post Sampling 1425	115	4.49	.208	13.1	>999

Well V well	Annulus* dia	Annulus* V annulus
1.5" 0.10gal/ft	4.0	0.29gal/ft
2" 0.17gal/ft	6.5	0.46gal/ft
	7.25	0.59gal/ft
	7.75	0.69gal/ft
	8.25	0.79gal/ft
4" 0.66gal/ft	8.25	0.64gal/ft
	10.25	1.06gal/ft
	12.25	1.63gal/ft
6" 1.5gal/ft	12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
DIM0001YV	VOA	2 x 40	N	HCl pH<2	AMBER	1415
DIM0001YS	BNA	1000	N	ICE	AMBER	1415
DIM0001YM	METAL	500	N	HNO_3 pH<2	HDPE	1415
DIM0001ZM	METAL	500	Y	HNO_3 pH<2	HDPE	1415

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)

ESTIMATED DEPTH TO BOTTOM OF SEAL (10' SCREEN + 5' SAND) AND VOLUME OF ANNULUS

*Assumes 30% porosity

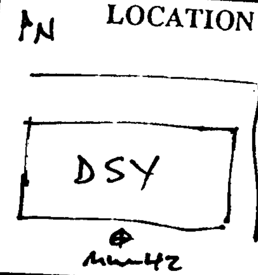
Signature [signature] Date 2/23/93 No. of Bottles 5

Arthur D Little

Monitoring Well Sampling Data Sheet

Well No.	MW-42
Client	USAEC
Project	FT MEADE
Case No.	67069

LOCATION



Date Sampled: 2/24/93	Sampled By: NAUGHTON/WERBER	
Depth to Water: 42.15'	Total Depth: 46.9'	
O_2 20.9	LEL 000	PID 1.4

Measuring Point: BLACK MARK TOP OF PVC RISER

Equipment: KECK PUMP, TEFLON BAILER

WELL VOLUME (* use appropriate values in table for each code letter)

V well [0.66] x [(Depth Screen Bottom [46.9] - Depth Water [42.2])] = Gallons of Water (well) [4.4]

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus [1.06] x [(Depth Screen Bottom [46.9] - Depth Bottom of Seal [31.5])] = Gallons of Water (annulus) [16.3]

WATER TO BE REMOVED

[(Gallons of Water (well) [4.4] + Gallons of Water (annulus) [16.3])] x Removal Multiplier [5] = Total Gallons to be Removed [103.5]

Actual Gallons Removed [105]

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
1300	0	4.75	.273	4.9	599
1420	105	4.85	.303	12.1	0
Post Sampling 1445	105	4.77	.287	11.8	>999

Well V well	Annulus* dia	Annulus* V annulus
1.5" 0.10gal/ft	4.0	0.29gal/ft
2" 0.17gal/ft	6.5	0.46gal/ft
	7.25	0.59gal/ft
	7.75	0.69gal/ft
	8.25	0.79gal/ft
4" 0.66gal/ft	8.25	0.64gal/ft
	10.25	1.06gal/ft
	12.25	1.63gal/ft
6" 1.5gal/ft	12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
D1M0042YV	VOA	2 x 40	N	HCl pH<2	AMBER	1430
D1M0042YS	BNA	1000	N	ICE	AMBER	1430
D1M0042YM	METAL	500	N	HNO_3 pH<2	HDPE	1430
D1M0042ZM	METAL	500	Y	HNO_3 pH<2	HDPE	1430

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)
ASSUMED SIZE OF ANNULUS

* Assumes 30% porosity

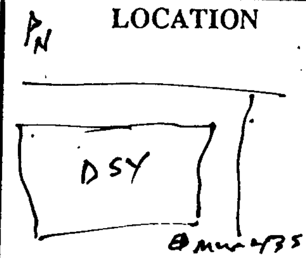
Signature J P Naughton Date 2/24/93 No. of Bottles 5

Arthur D Little

Monitoring Well Sampling Data Sheet

Well No.	MW-435
Client	USAEC
Project	FT MEADE
Case No.	67069

LOCATION



Date Sampled: 2/24/93 | Sampled By: WEBBER/GOLDTHWAITE

Depth to Water: 35.5' | Total Depth: 42.2'

O_2 20.9 | LEL 000 | PID 0.0

Measuring Point: BLACK MARK TOP OF PVC RISER

Equipment: KECK PUMP, TEFLON BAILER

WELL VOLUME (* use appropriate values in table for each code letter)

V well [0.66] x [(Depth Screen Bottom [42.2] - Depth Water [35.5])] = Gallons of Water (well) [4.4]

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus [1.06] x [(Depth Screen Bottom [42.2] - Depth Bottom of Seal [27.0])] = Gallons of Water (annulus) [16.1]

WATER TO BE REMOVED

[(Gallons of Water (well) [4.4] + Gallons of Water (annulus) [16.1])] x Removal Multiplier [5] = Total Gallons to be Removed [102.5]

Actual Gallons Removed [105]

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
0815	0	4.18	.940	10.9	593
0920	120	4.21	.778	11.7	0
Post Sampling 0930	120	4.42	.743	11.6	>999

Well V well	Annulus* dia	V annulus
1.5" 0.10gal/ft	4.0	0.29gal/ft
2" 0.17gal/ft	6.5	0.46gal/ft
	7.25	0.59gal/ft
	7.75	0.69gal/ft
	8.25	0.79gal/ft
4" 0.66gal/ft	8.25	0.64gal/ft
	10.25	1.06gal/ft
	12.25	1.63gal/ft
6" 1.5gal/ft	12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
D1M0435YV	VOA	2x40	N	HCl pH<2	AMBER	0930
D1M0435YS	BNA	1000	N	ICE	AMBER	0930
D1M0435YM	METAL	500	N	HNO_3 pH<2	HDPE	0930
D1M0435YF	METAL	500	Y	HNO_3 pH<2	HDPE	0930

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)
ASSUMED SIZE OF ANNULUS

* Assumes 30% porosity

Signature [signature] Date 2/24/93 No. of Bottles 5

Arthur D Little

Monitoring Well Sampling Data Sheet

Well No. MW-43D
Client USAEC
Project FT MEADE
Case No. 67069

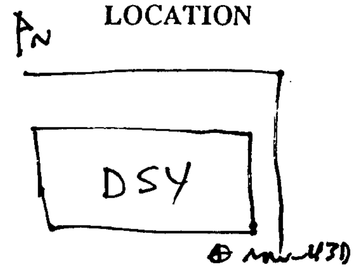
Date Sampled: 2/24/93	Sampled By: WEBBER / GOLDTHWAITE
Depth to Water: 36.2'	Total Depth: 93.0'

O_2 20.9 | LEL 000 | PID 0.0

Measuring Point: BLACK MARK TOP OF PVC RISER

Equipment: KECK PUMP, TEFLON BAILER

LOCATION



WELL VOLUME (* use appropriate values in table for each code letter)

V well [0.66] x [(Depth Screen Bottom [93.0] - Depth Water [36.2'])] = Gallons of Water (well) [37.5]

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus [1.06] x [(Depth Screen Bottom [93.0] - Depth Bottom of Seal [81.0])] = Gallons of Water (annulus) [12.7]

WATER TO BE REMOVED

[(Gallons of Water (well) [37.5] + Gallons of Water (annulus) [12.7])] x Removal Multiplier [5] = Total Gallons to be Removed [256]

Actual Gallons Removed [260]

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
0920	0	6.49	.606	11.3	384
1130	260	4.72	.578	9.8	2
Post Sampling 1145	260	6.51	.595	11.4	19

Well	V well	Annulus* dia	V annulus
1.5"	0.10gal/ft	4.0	0.29gal/ft
2"	0.17gal/ft	6.5	0.46gal/ft
		7.25	0.59gal/ft
		7.75	0.69gal/ft
		8.25	0.79gal/ft
4"	0.66gal/ft	8.25	0.64gal/ft
		10.25	1.06gal/ft
		12.25	1.63gal/ft
6"	1.5gal/ft	12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
DIMO43DYV	VOA	2 x 40	N	HCl pH < 2	AMBER	1145
DIMO43DYS	BNA	1000	N	ICE	AMBER	1145
DIMO43DYM	METALS	500	N	HNO_3 pH < 2	HDPE	1145
DIMO43DZM	METALS	500	Y	HNO_3 pH < 2	HDPE	1145

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)
ASSUMED SIZE OF ANNULUS

* Assumes 30% porosity

Signature GPNaught   Date 2/24/93   No. of Bottles 5

Arthur D Little

Monitoring Well Sampling Data Sheet

Well No. MW-200
Client USAEC
Project FT MEADE
Case No. 67069

Date Sampled: 2/23/93	Sampled By: WEBBER/GOLDTHWAITE
Depth to Water: 50.35	Total Depth: 59.75'

O2 21.0 | LEL 000 | PID 0.0

Measuring Point: NOTCH IN TOP OF PVC RISER

Equipment: KECK PUMP, TEFLON BAILER

LOCATION

DSY

MW-200

WELL VOLUME (* use appropriate values in table for each code letter)

V well		Depth Screen Bottom		Depth Water		Gallons of Water (well)
0.66	x [(	59.8	-	50.4	)] =	6.2

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus		Depth Screen Bottom		Depth Bottom of Seal		Gallons of Water (annulus)
1.06	x [(	59.8	-	43.0	)] =	17.8

WATER TO BE REMOVED

	Gallons of Water (well)		Gallons of Water (annulus)		Removal Multipler		Total Gallons to be Removed	Actual Gallons Removed
[(	6.2	+	17.8	)] x	5	=	120	120

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
1440	0	4.68	.234	7.5	99
1610	120	4.46	.226	11.9	2
Post Sampling 1620	120	4.66	.219	11.9	355

Well V well	Annulus* dia	V annulus
1.5" 0.10gal/ft	4.0	0.29gal/ft
2" 0.17gal/ft	6.5	0.46gal/ft
	7.25	0.59gal/ft
	7.75	0.69gal/ft
	8.25	0.79gal/ft
4" 0.66gal/ft	8.25	0.64gal/ft
	10.25	1.06gal/ft
	12.25	1.63gal/ft
6" 1.5gal/ft	12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
DIMO200YV	VOA	2 x 40	N	HCl pH<2	AMBER	1615
DIMO200YS	BNA	1000	N	ICE	AMBER	1615
DIMO200YM	METALS	500	N	HNO_3 pH<2	HDPE	1615
DIMO200ZM	METALS	500	Y	HNO_3 pH<2	HDPE	1615

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)

DSY FIELD BLANK QIXF153 YV, YS, YM DECANTED 1545
DSY RINSE BLANK QIXR253 YV, YS, YM DECANTED 1600

*Assumes 30% porosity

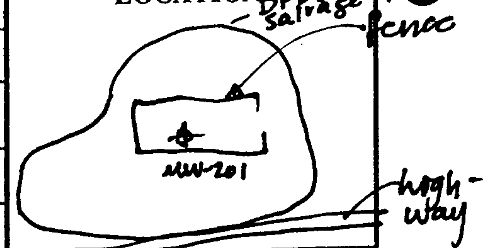
Signature GP Nwgt Date 2/23/93 No. of Bottles 5

Arthur D Little

Monitoring Well Sampling Data Sheet

Well No. DSY-MW-201
Client USAEC
Project FLGM
Case No. 67069-25

LOCATION



Date Sampled: 3/17/93 / 3/18/93 | Sampled By: Webber / Friedenson

Depth to Water: 30.99' | Total Depth: 38.73

O_2 11.4 | LEL 000 | PID 1.7

Measuring Point: notch in pvc riser

Equipment: Keck pump, teflon bailer

WELL VOLUME (* use appropriate values in table for each code letter)

V well [0.66] x [([Depth Screen Bottom 38.73] - [Depth Water 30.99])]= [Gallons of Water (well) 5.11]

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus [1.06] x [([Depth Screen Bottom 38.73] - [Depth Bottom of Seal 21'])]= [Gallons of Water (annulus) 18.79]

WATER TO BE REMOVED

[([Gallons of Water (well) 5.11] + [Gallons of Water (annulus) 18.79])] x [Removal Multipier 5] = [Total Gallons to be Removed 119.5]

Actual Gallons Removed: 57

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
3/17/93 0950	0	5.07	0.270	13.1	303
3/18/93 11:50	57	4.68	0.181	12.0	7999
Post Sampling 1210	59	4.79	0.219	12.5	7999

Well	V well	Annulus* dia	V annulus
1.5"	0.10gal/ft	4.0	0.29gal/ft
2"	0.17gal/ft	6.5	0.46gal/ft
		7.25	0.59gal/ft
		7.75	0.69gal/ft
		8.25	0.79gal/ft
4"	0.66gal/ft	8.25	0.64gal/ft
		10.25	1.06gal/ft
		12.25	1.63gal/ft
6"	1.5gal/ft	12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
D1M0201YV	VOA	40ML (x2)	N	HCl	amber glass vial (2)	
D1M0201YS	SVOA	1000		Ice	amber glass jar	
D1M0201YM	METALS	500		HNO3	HDPE	
D1M0201ZM	FILT-METALS	500	Y			

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)

* Assumes 30% porosity

Signature ____________ Date ________ No. of Bottles ______

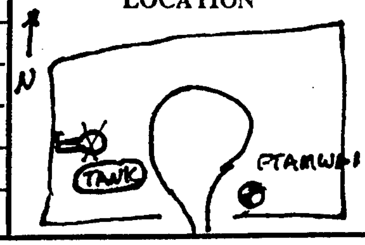
Appendix B: Fire Training Area Field Forms

Appendix B-1: Fire Training Area Soil Boring Logs and Monitoring Well Installation Logs

Arthur D Little	Soil Boring Log	Boring No. FTAMW-1 Client USAEC Project Fort Meade Case No. 67069-22

Date Start	1/21/93	Contractor	ATEC
Date Complete	1/21/93	Drill Method	Hollow Steem Auger
Hole Diameter	1.1'	Type Of Rig	Mobil B-61
Casing Size	0.6'	Drilling Additives	No
Boring Depth	15.0'	Geologist	M. greenwood, G. Naughton
Sampling Method	SPLIT SPOON		

LOCATION



Scale in Feet	SAMPLE Type and number	SAMPLE Interval	SAMPLE Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
0.0	SS01	0.5-2.5	1.5	8 3 5 4	0.7	[SW] 0-.4' greenish black 5GY 2/1 well sorted fine grained sand, dry, petroleum odor 0.4-1.2' dark yellowish orange 10YR 6/6 well sorted fine sand, trace sub angular pebbles, moist 1.2-~~1.6~~ light brown 5YR 5/6 poorly sorted fine to medium sand, some subangular pebbles, loose
1.0						
2.0						
3.0						
4.0						
5.0	SS02	5.0-7.0	1.25	6 12 7 12	6.7	[SP] Light brown 5YR 5/6, Poorly sorted fine to medium sand, moist, loose
6.0						
7.0						
8.0						
9.0						
10.0	SS03	10.0-12.0	1.1'	7 6 12 13	1.5	~~0-0.5'~~ PREDOMINANTLY LIGHT BROWN 5YR 5/6 POORLY SORTED FINE TO MEDIUM SAND, 0.1-0.2' FINE SILT LIGHT BROWN, MOIST, MEDIUM DENSE [SP]
11.0						
12.0			1.1'			
13.0						

Rod Size - AW
Bit type - NA
Pump type - MOYNO

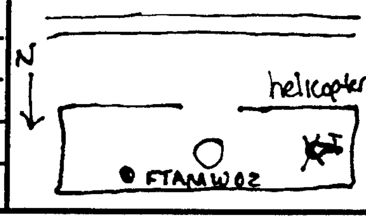
Auger/Casing Size - 6 5/8 ID
11.6 OD
Hammer weight - 140 lbs
length of fall - 30 inches

Arthur D Little	**Soil Boring Log** Continuation Page	Boring No. FTAMW-1 Client USAEC Project Fort Meade Case No. 67069-22

Scale in Feet	SAMPLE Type and number	Interval	Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
13.0	SS04	13.0-15.0'	1.5'	3 5 6 7	1.7	[ML] 0-0.8 dark yellowish brown 10YR 4/2 silt, some clay, trace fine sand, moist [CL] 0.8-1.5 dark yellowish brown 10YR 4/2, clayey silt, trace fine sand, moist, loose
14.0						
15.0						
16.0						
17.0						

Arthur D Little	Soil Boring Log	Boring No. FTAMW-2 Client USATHAMA Project FORT MEADE Case No. 67069-22

Date Start 1/19/93	Contractor ATEC	LOCATION
Date Complete 1/20/93	Drill Method Hollow Stem Auger	
Hole Diameter 1.1'	Type Of Rig Mobil B-61	
Casing Size 0.6'	Drilling Additives —	
Boring Depth 16.5	Geologist M. GREENWOOD, G. NAUGHTON	
Sampling Method Split spoon (2"-24") every 5'		



Scale in Feet	SAMPLE Type and number	Interval	Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
0.0	geo SS01	0-2	22"	6 10 6 4	22.2	[SP] light brown, poorly sorted medium to course sand, dry, loose
1.0						
2.0						
3.0						
4.0 ∇						
5.0	geo SS02	5-7'	12.5"	5 10 13 14	22.2	[SP] same as above, moist
6.0						
7.0						
8.0						
9.0						
10.0	geo SS03	10-12	10"	4 5 8 9	26.7	[SP] same as above, very wet
11.0						
12.0						
13.0						

Rod size - AW
bit Type - NA
Pump type - MOYNO

AUGER/CASING SIZE - 6 5/8 ID
11.6 OD

Hammer weight - 140 lbs
length of fall - 30 inches

Arthur D Little	Soil Boring Log Continuation Page	Boring No. FTAMW-02 Client USATHAMA Project FORT MEADE Case No. 67069-22

Scale in Feet	SAMPLE Type and number	Interval	Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
13.0						
14.0						
15.0	geo 5504	14.5-16.5	16"	1 2 4 4	<1.6	[SP] 1-3" Same as above 3-16" DK. Yellowish brown 10YR 4/2, Silty with Some fine sand, trace clay, moist, Very loose [ML]
16.0						
17.0						* A Total of 15 gallons of approved water was used to flush out heavy sedimentation

Arthur D Little

Soil Boring Log

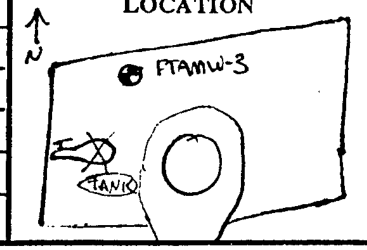
Boring No. FTAMW-3
Client USAEC
Project Fort Meade
Case No. 67069-22

Date Start	1-20-93	Contractor	ATEC
Date Complete	1-20-93	Drill Method	Hollow Stem Auger
Hole Diameter	1.1'	Type Of Rig	Mobil B-61
Casing Size	0.6'	Drilling Additives	None
Boring Depth	~~14.10'~~ 15'	Geologist	M. Greenwood, G. Naughton

DAA 4/20/93

Sampling Method 2' ~~x 24 ins~~ splitspoon every 5.0'

LOCATION



Scale in Feet	SAMPLE Type and number	SAMPLE Interval	SAMPLE Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
0.0 – 2.0	geo SS01	0-2'	1.2'	4, 15, 12, 7	0.0	[SP] Predominantly dark yellowish orange 10YR 6/6 ~~my~~ with poorly sorted medium grained sand with some cobbles and subrounded pebbles, dry loose compaction. The first 4 inches of the spoon was moderate yellowish brown 10YR 5/4 poorly sorted sand with some sm. pebbles and some organics
2.0 – 5.0						
5.0 – 7.0	geo 5-7	5-7'	1'	3, 6, 8, 8	3.4	[SP] Same as above, very moist, grain size is becoming progressively smaller with depth, no cobbles
7.0 – 10.0						
10.0 – 12.0	geo 10-12'		1.4'	5, 10, 8, 9	0.0	[SP] Mottled, primarily dark yellowish orange 10YR 6/6 with bands of light brown 5YR 5/6 and pale yellowish brown 10YR 6/2, poorly sorted fine sand, very moist, loose compaction
12.0 – 13.0						

Rod Size - AW
Bit Type - NA
Pump Type - MOYNO

Auger/Casing - 6 5/8 ID
11.6 OD

Hammer weight - 140 lb.
length of hammer fall - 30 inches

Arthur D Little

Soil Boring Log
Continuation Page

Boring No. FTAMW-3
Client USAEC
Project FORT MEADE
Case No. 67069-22

Scale in Feet	SAMPLE Type and number	Interval	Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
13.0 – 15.0	geo * SS0$4	13-15'	1.8'	2 4 4 5	0.0	[SP] 0-0.6' Dark yellowish brown 10 yr 4/2, Poorly sorted fine sand, wet [OL, PT] 0.6-1.5' Dark yellowish brown 10 yr 4/2, silt with some poorly sorted fine sand, trace clay, some peat, moist [CL] 1.5-1.8 Dark Yellowish brown 10 yr 4/2, clayey silt with trace fine sand, most, loose compaction

* A TOTAL OF 20 gallons of approved H_2O were lost down the well while drilling in an effort to flush out heavily sedimentation.

* ~~A TOTAL OF 20 GAL. OF APPROVED WATER WAS USED TO FLUSH OUT THE heavily sedimented buildup INSIDE the CASING~~ MAG

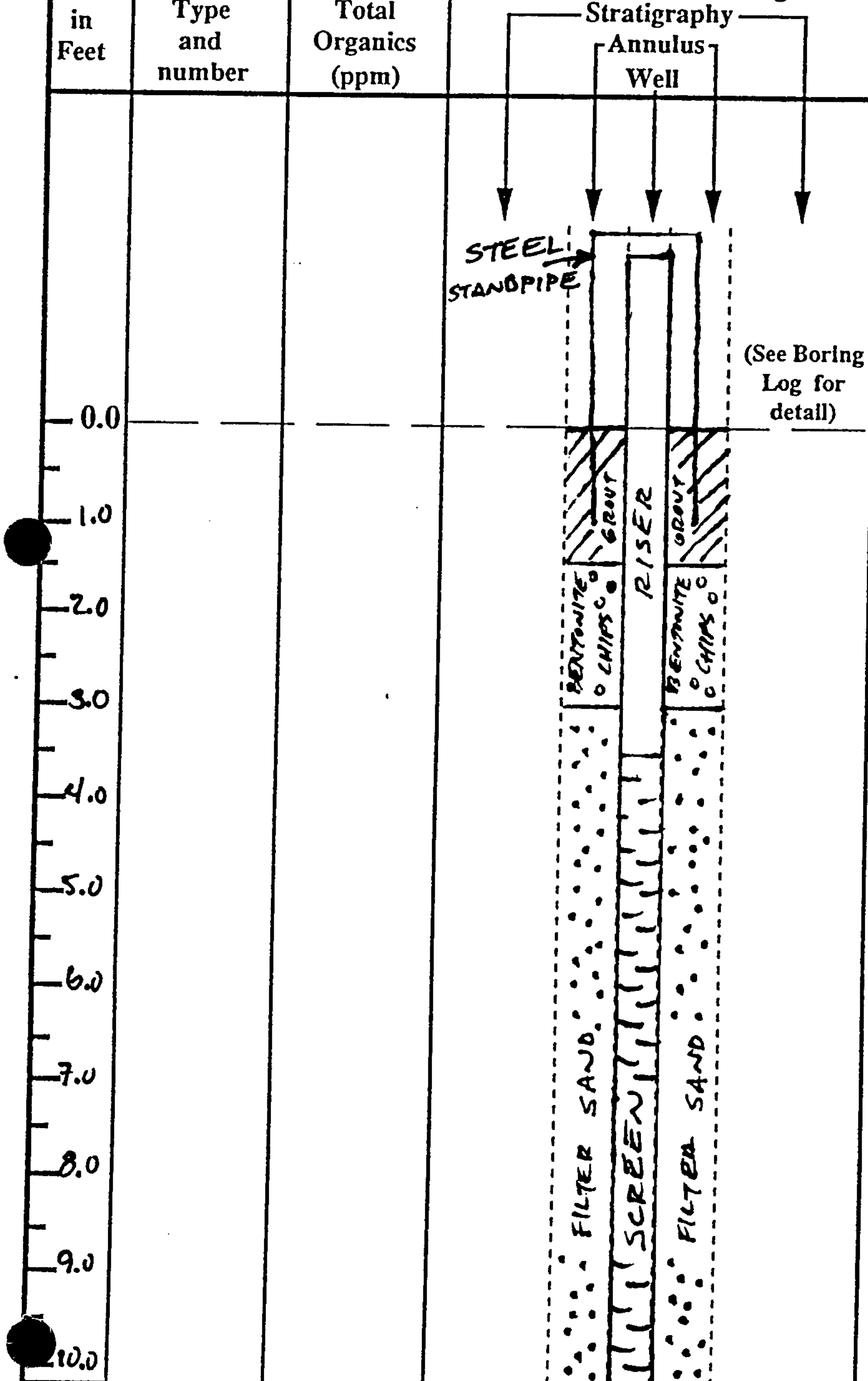
Arthur D Little

Monitoring Well Design

Boring No.	FTAMW-1
Client	USAEC
Project	Fort Meade
Case No.	67069-22

Date Start 1/21/93	Date Complete 1/21/93	Hole Diameter 1.1'	Casing Size 0.6'
Contractor ATEC		Geologist M. Greenwood, G. Naughton	
Drill Method Hollow Stem Auger		Boring Depth 15.0'	
Type Of Rig Mobil B-61		Grout method Portland (Type II) Cement & bentonite	
Datum double notch PVC riser		Development Method To be developed	
Notes			

Scale in Feet	SAMPLE Type and number	SAMPLE Total Organics (ppm)	Well Construction Diagram	Construction Specifications



Elevation Top Of Casing ____________

Elevation Top Of Riser Pipe ____________

Elevation Ground Surface ____________

(surveyed elevations)
(depth from ground surface)

Type of Surface Casing 3.6' STEEL STANDPIPE
I.D. Surface Casing 0.6'

Type Of Riser Pipe PVC
I.D. Riser Pipe ~~0.4'~~ 0.33' DJV 4/20/93

Diameter Of Borehole 1.1'

Type Of Backfill NA

Type Of Seal PureGold Md.Chips-Bentonite
Depth To Top Of Seal 1.5'

Type Of Sand Pack Silica Quartz sand
Depth To Top Of Sand Pack 3.0'

Type Of Screen PVC
Slot Size 0.010
I.D. Screen 0.4'
Screened Interval 13.5' - 3.5'

Depth To Bottom Of Well 13.5'

Depth To Bottom Of Borehole 15.0'

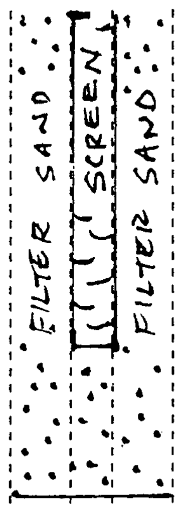
*CETCO - Colloid Environmental Technologies Company
Md - Medium

Arthur D Little

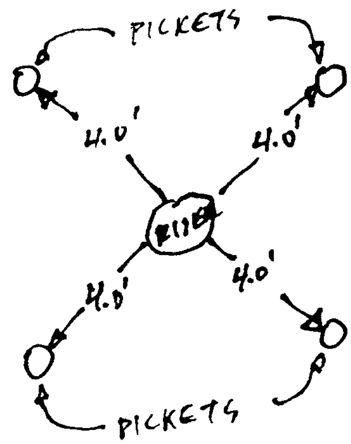
Monitoring Well Design
(Continuation Page)

Boring No.	FTAMW-1
Client	USAEC
Project	Fort Meade
Case No.	67069.22

Scale in Feet	SAMPLE: Type and number	SAMPLE: Total Organics (ppm)	Well Construction Diagram (Stratigraphy, Annulus, Well)	Notes and Comments
10.0				PICKET CONFIGURATION
11.0				
12.0				
13.0				
14.0				
15.0				



PICKET CONFIGURATION



Arthur D Little

Monitoring Well Design

Boring No.	FTA MW-2
Client	USATHAMA
Project	FORT MEADE
Case No.	67069-22

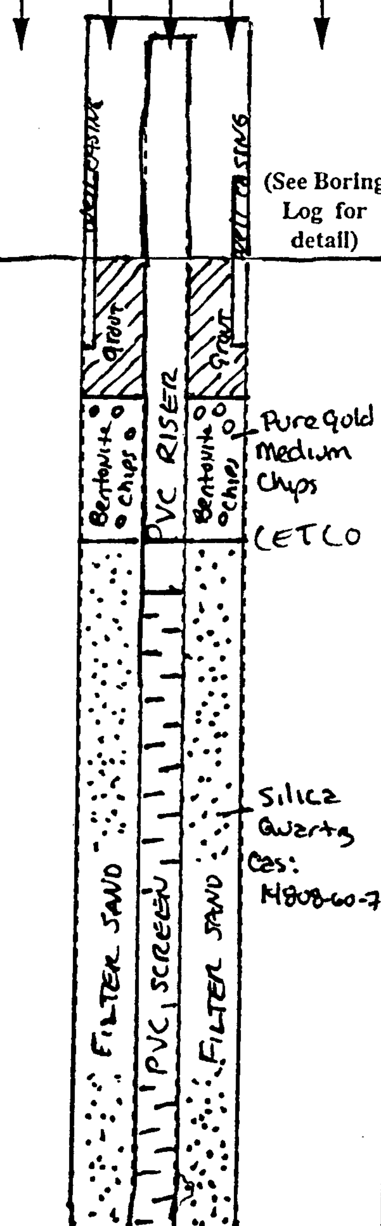
Date Start	1/20/93	Date Complete	1-20-93	Hole Diameter	1.1'	Casing Size	0.6'

Contractor	ATEC	Geologist	MARY GREENWOOD, GEORGE NAUGHTON
Drill Method	HOLLOW STEM AUGER	Boring Depth	16.6 FEET
Type Of Rig	MOBILE B-61	Grout method	20 pt. Portland (II) cement & Bent.
Datum	Double notch on PVC riser	Development Method	TO BE DEVELOPED.
Notes			

Scale in Feet	SAMPLE: Type and number	SAMPLE: Total Organics (ppm)
3.0		
2.5		
2.0		
1.0		
0.0		
1.0		
2.0		
3.0		
4.0		
5.0		
6.0		
7.0		
8.0		
9.0		
10.0		

Well Construction Diagram

Stratigraphy, Annulus, Well



(See Boring Log for detail)

Construction Specifications

Elevation Top Of Casing ____________

Elevation Top Of Riser Pipe ____________

Elevation Ground Surface ____________

(surveyed elevations)

(depth from ground surface)

Type of Surface Casing 2.6' stainless steel

I.D. Surface Casing 6"

Type Of Riser Pipe PVC

I.D. Riser Pipe 4"

Diameter Of Borehole 1.1'

Type Of Backfill grout

Type Of Seal Bentonite chips

Depth To Top Of Seal 1.6'

Type Of Sand Pack Silica Quartz CAS 14808-60-7

Depth To Top Of Sand Pack 3.0'

Type Of Screen /

Slot Size 0.010

I.D. Screen 4"

Screened Interval 13.6 - 3.6'

Depth To Bottom Of Well 13.6'

Depth To Bottom Of Borehole 16.6'

*CETCO - Colloid Environmental Technologies Company

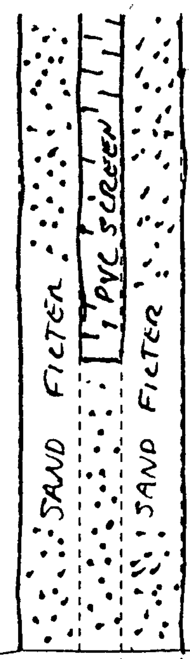
Arthur D Little

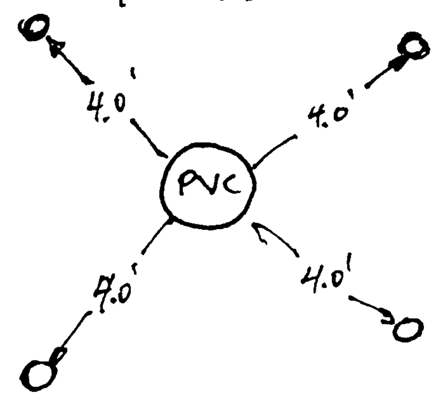
Monitoring Well Design

(Continuation Page)

Boring No.	FTAMW-2
Client	USATHAMA
Project	Fort Meade
Case No.	67069-22

Scale in Feet	SAMPLE Type and number	SAMPLE Total Organics (ppm)	Well Construction Diagram (Stratigraphy, Annulus, Well)	Notes and Comments
10.0				Picket fence was constructed 4.0' from the PVC riser, Pickets extending 3.0' above the surface
11.0				
12.0				
13.0				
14.0				
15.0				
16.0				
16.6'				
17.0				

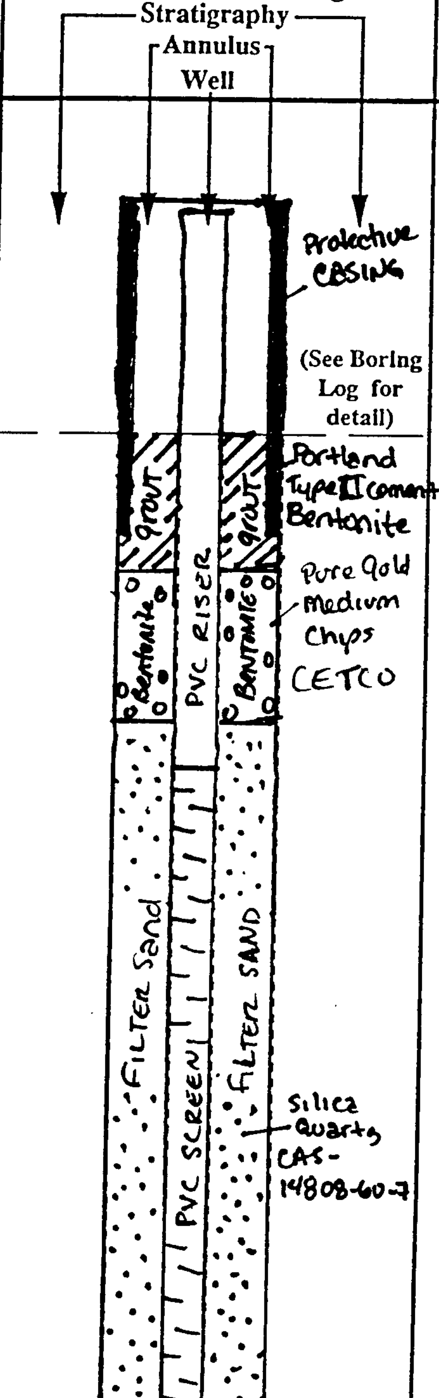




Arthur D Little	Monitoring Well Design	Boring No. FTAMW-3 Client USAEC Project Fort Meade Case No. 69069-22

Date Start 1-20-93	Date Complete 1-20-93	Hole Diameter 1.1'	Casing Size 0.6'
Contractor ATEC		Geologist M. Greenwood, G. Naughton	
Drill Method Hollow Stem Auger		Boring Depth 14.10'	
Type Of Rig Mobil B-61		Grout method Portland (II) cement, Bent. & H_2O	
Datum Double Notch on PVC riser		Development Method To be developed	
Notes			

Scale in Feet	SAMPLE: Type and number	SAMPLE: Total Organics (ppm)	Well Construction Diagram
2.5			
2.0			
1.0			
0.0			
1.0			
2.0			
3.0			
4.0			
5.0			
6.0			
7.0			
8.0			
9.0			



Construction Specifications

Elevation Top Of Casing ______

Elevation Top Of Riser Pipe ______

Elevation Ground Surface ______

(surveyed elevations)

(depth from ground surface)

Type of Surface Casing STAINLESS STEEL

I.D. Surface Casing ~~4~~ 6"

Type Of Riser Pipe PVC

I.D. Riser Pipe 4"

Diameter Of Borehole 1.1'

Type Of Backfill NA

Type Of Seal Bentonite Chips (Pure gold medium chips)

Depth To Top Of Seal 1.6

Type Of Sand Pack Silica Quartz CAS 14808-60-7

Depth To Top Of Sand Pack 3.0

Type Of Screen PVC

Slot Size 0.010

I.D. Screen 4"

Screened Interval 13.6' - 3.6'

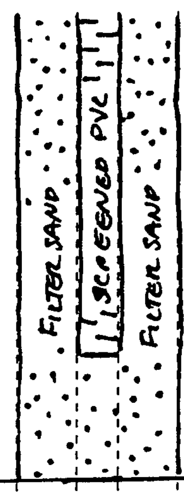
Depth To Bottom Of Well 13.6'

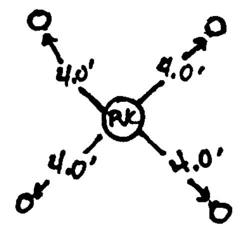
Depth To Bottom Of Borehole 14.10'

*CETCO - Colloid Environmental Technologies Company

Arthur D Little	Monitoring Well Design (Continuation Page)	Boring No. FTAMW-3 Client USAEC Project Fort Meade Case No. 67069-22

Scale in Feet	SAMPLE Type and number	SAMPLE Total Organics (ppm)	Well Construction Diagram (Stratigraphy, Annulus, Well)	Notes and Comments
10.0				
11.0				
12.0				
13.0				
14.0				
15.0				





Pickets - 4 5.6' Pickets installed 2.6' into the ground, 4.0' from PVC riser

Appendix B-2: Fire Training Area Monitoring Well Development Logs

Arthur D Little

Monitoring Well Development Data Sheet

Well No.	FTAMW-1
Client	USAEC
Project	Ft. Meade
Case No.	67069-26

LOCATION

Date Developed:	2/5/98	Developed By:	M. Greenwood
Depth to Water:	5.19	Total Depth:	15.71
0^2 BD-20.7 DD-20.9 AD-	LEL BD-0.002 DD-0.000 AD-	HNu BD-0.4 DD-0.1 AD-	

Measuring Point: Double Notch on PVC Riser

Notes: PVC stick-up - 1.45'

WELL VOLUME (* use appropriate values in table for each code letter)

V well [0.66] x [(Depth Screen Bottom [15.71] - Depth Water [5.19])] = Gallons of Water (well) [1.69]

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annalus [1.06] x [(Depth Screen Bottom [15.71] - Depth Bottom of Seal [3.00])] = Gallons of Water (annalus) [13.47]

WATER TO BE REMOVED

[(Gallons of Water (well) [1.69] + Gallons of Water (annulus) [13.47])] x Removal Multiplier [5] = Total Gallons to be Removed [76]

Actual Gallons Removed [81]

MEASUREMENTS

Time	Number of Gallons Removed 0.0 gallons	pH	Conductivity	Temperature	Turbidity
1025	0.0	6.60	.122 mS/cm	13.8°C	8
1055	25.0	6.23	.085 mS/cm	17.5°C	999
1110	50.0	6.20	.092 mS/cm	15.8°C	999
1120	75.0	6.15	.099 mS/cm	15.4°C	345
1130	85.0	6.18	.094 mS/cm	17.1	1.74

TABLE

Well V well	Annalus * dia	V annalus
2" 0.17gal/ft	6.5	0.46gal/ft
	7.25	0.59gal/ft
	7.75	0.69gal/ft
	8.25	0.79gal/ft
4" 0.66gal/ft	8.25	0.64gal/ft
	10.25	1.06gal/ft
	12.25	1.63gal/ft
6" 1.5gal/ft	12.25	1.41gal/ft

Depth to Sediment: Before 15.71 After 15.71

Type/Capacity of pump Keck pump

Pumping Rate

Recharge Time

Time to Develop Well: Start 1030 Finish 1125 Duration 55 min

COMMENTS (include description of water removed)

The water began to become visibly clearer around 45 gallons

* Assumes 30% porosity for sand pack

BD - Before development
DD - During development
AD - After development
} Measurements taken at the top of the PVC riser

Arthur D Little	**Monitoring Well Development Data Sheet**	Well No. FtMW-2 Client US AEC Project Ft Meade Case No. 67069-26

Date Developed: FEB 8, 1993	Developed By: EF/MG	LOCATION
Depth to Water: 6.19	Total Depth: 15.71	
0^2 20.6	LEL 0	HNu 1.6
Measuring Point: double notch on PVC Riser		
Notes:		

WELL VOLUME (* use appropriate values in table for each code letter)

V well		Depth Screen Bottom		Depth Water		Gallons of Water (well)
0.66	x [(	15.71	-	6.19	)] =	6.28

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annalus		Depth Screen Bottom		Depth Bottom of Seal		Gallons of Water (annalus)
1.06	x [(	15.71	-	3	)] =	13.47

WATER TO BE REMOVED

	Gallons of Water (well)		Gallons of Water (annulus)		Removal Multipier		Total Gallons to be Removed	Actual Gallons Removed
[(	6.28	+	13.47	)] x	5	=	99	100

MEASUREMENTS

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
1410	0.0 gallons	8.21	.060	18.3	10
1445	30.0	6.93	.059	17.4	999
1505	60.0	5.87	.061	15.7	10
1520	92.0	~~5.90~~ 5.87	.060	16.2	10
1525	100.0	5.87	.059	16.2	10

TABLE

Well V well	Annulus * dia	V annalus
2" 0.17gal/ft	6.5	0.46gal/ft
	7.25	0.59gal/ft
	7.75	0.69gal/ft
	8.25	0.79gal/ft
4" 0.66gal/ft	8.25	0.64gal/ft
	10.25	1.06gal/ft
	12.25	1.63gal/ft
6" 1.5gal/ft	12.25	1.41gal/ft

Depth to Sediment: Before 15.71 After 15.54

Type/Capacity of pump Keck

Pumping Rate | Recharge Time

Time to Develop Well: Start 1400 Finish 1525 Duration 225

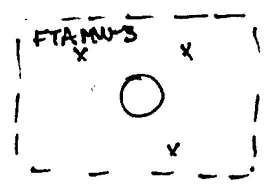
COMMENTS (include description of water removed)

15.54 Final H_2O level

* Assumes 30% porosity for sand pack

Arthur D Little	# Monitoring Well Development Data Sheet	Well No. FTA MW-3 Client US AEC Project Fort Meade Case No. 67069-26

Date Developed: 2/9/93	Developed By: Vesper/Friederson	LOCATION
Depth to Water: 5.76'	Total Depth: 15.65	
0^2 20.7	LEL 0.0 %	HNu 0.0 ppm
Measuring Point: double notch on PVC		
Notes:		



WELL VOLUME (* use appropriate values in table for each code letter)

V well [0.66] x [([15.65] Depth Screen Bottom - [5.76] Depth Water)] = [6.53] Gallons of Water (well)

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annalus [1.06] x [([15.65] Depth Screen Bottom - [3.0] Depth Bottom of Seal)] = [12.65] Gallons of Water (annalus)

WATER TO BE REMOVED

[([6.53] Gallons of Water (well) + [12.65] Gallons of Water (annulus))] x [5] Removal Multipier = [95.9] Total Gallons to be Removed

Actual Gallons Removed [100]

MEASUREMENTS

Time	Number of Gallons Removed	pH	Conductivity mS/cm	Temperature °C	Turbidity
0840	0.0 gallons	3.4	0.13	8	10
~~0840~~	.				
0910	25	4.1	0.11	9	990
0930	50	~~4.6~~ 4.0	0.10	9	~~0.10~~ 550
pretty clear 0945	75	4.2	0.10	9	10
1000	100	4.0	0.10	4	90

TABLE

Well		Annalus *	
V well		dia	V annalus
2"	0.17gal/ft	6.5	0.46gal/ft
		7.25	0.59gal/ft
		7.75	0.69gal/ft
		8.25	0.79gal/ft
4"	0.66gal/ft	8.25	0.64gal/ft
		10.25	1.06gal/ft
		12.25	1.63gal/ft
6"	1.5gal/ft	12.25	1.41gal/ft

Depth to Sediment: Before ~15.60 After 15.65 difficult to tell

Type/Capacity of pump Keck

Pumping Rate ~2.5 gpm | Recharge Time

Time to Develop Well: Start 0840 Finish 1000 Duration 1hr 20 min

COMMENTS (include description of water removed)

- pH on meter responding slowly
- water initially reddish brown, turbid
- cleared somewhat by end - still cloudy
- did not account for standup → purged extra volume

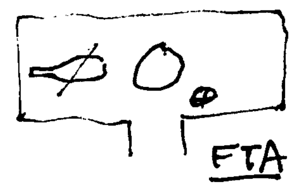
* Assumes 30% porosity for sand pack

Appendix B-3: Fire Training Area Monitoring Well Sampling Logs

Arthur D Little	# Monitoring Well Sampling Data Sheet	Well No. FTA MW-1 Client USAEC Project FT MEADE Case No. 67069

Date Sampled: 2-18-93 | Sampled By: ELLINGWOOD / FRIEDENSON / NAUGHTON
Depth to Water: 4.42' | Total Depth: 15.95'
O_2 21.1 | LEL 001 | PID 0.1
Measuring Point: DOUBLE NOTCH TOP OF RISER
Equipment: ORS INTERFACE PROBE, KECK PUMP, TEFLON BAIL

LOCATION



WELL VOLUME (* use appropriate values in table for each code letter)

V well [0.66] x [(Depth Screen Bottom [16.0] - Depth Water [4.4])] = Gallons of Water (well) [7.66]

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus [0.64] x [(Depth Screen Bottom [16.0] - Depth Bottom of Seal [5.0])] = Gallons of Water (annulus) [7.04]

WATER TO BE REMOVED

[(Gallons of Water (well) [7.7] + Gallons of Water (annulus) [7.0])] x Removal Multiplier [5] = Total Gallons to be Removed [73.5]

Actual Gallons Removed [75]

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
~~0800~~ 0845	0	7.35	.175	4.9	10
0910	75	7.43	.127	7.7	8
Post Sampling 0940	75	7.56	.127	5.7	19

Well		Annulus*	
V well		dia	V annulus
1.5" 0.10gal/ft		4.0	0.29gal/ft
2" 0.17gal/ft		6.5	0.46gal/ft
		7.25	0.59gal/ft
		7.75	0.69gal/ft
		8.25	0.79gal/ft
4" 0.66gal/ft		8.25	0.64gal/ft
		10.25	1.06gal/ft
		12.25	1.63gal/ft
6" 1.5gal/ft		12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
FM0001YV	VOA	40	N	HCl pH<2	AMBER	0930
1YS	SEMI VOA	1000	N		AMBER	0930
1YH	PETRO HYDRO	1000	N	H_2SO_4 pH<2	AMBER	0930
1YM	METALS	500	N	HNO_3 pH<2	HDPE	0930
1ZM	FILTERED METALS	500	Y	HNO_3 pH<2	HDPE	0930

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)
Also collected a field blank (93QC-150) and a rinse blank (93QC-250) for same set of parameters.

*Assumes 30% porosity

Signature [signature] Date 2/18/93 No. of Bottles 6

Arthur D Little	Monitoring Well Sampling Data Sheet	Well No. FTA-MW-2 Client US AEC Project FT MEADE Case No. 67069

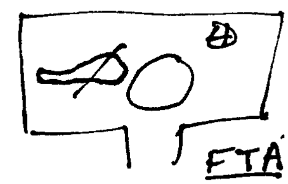
Date Sampled: 2-18-93	Sampled By: ELLINGWOOD/NAUGHTON	LOCATION
Depth to Water: 5.54'	Total Depth: 15.88'	

O_2 20.9	LEL 000	PID 0.0

Measuring Point: BLACK MARK TOP OF RISER

Equipment: KECK PUMP, TEFLON BAILER

PN LOCATION



WELL VOLUME (* use appropriate values in table for each code letter)

V well		Depth Screen Bottom		Depth Water		Gallons of Water (well)
.66	x [(	15.9	-	5.5	)] =	6.86

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus		Depth Screen Bottom		Depth Bottom of Seal		Gallons of Water (annulus)
.64	x [(	15.9	-	5.0	)] =	6.98

WATER TO BE REMOVED

	Gallons of Water (well)		Gallons of Water (annulus)		Removal Multiplier		Total Gallons to be Removed	Actual Gallons Removed
[(	6.9	+	7.0	)] x	5	=	69.5	70

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
0950	0	6.07	.104	6.3	459
1000	70	5.59	.100	8.8	140
Post Sampling 1040	70	5.64	.103	7.7	175

Well V well	Annulus* dia	V annulus
1.5" 0.10gal/ft	4.0	0.29gal/ft
2" 0.17gal/ft	6.5	0.46gal/ft
	7.25	0.59gal/ft
	7.75	0.69gal/ft
	8.25	0.79gal/ft
4" 0.66gal/ft	8.25	0.64gal/ft
	10.25	1.06gal/ft
	12.25	1.63gal/ft
6" 1.5gal/ft	12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
FIMOO2YV	VOA	40	N	HCl pH<2	AMBER	1030
2YS	SEMI VOA	1000	N		AMBER	1030
2YH	PETRO HYDRO	1000	N	H_2SO_4 pH<2	AMBER	1030
2YM	METALS	500	N	HNO_3 pH<2	HDPE	1030
2ZM	FILTERED METALS	500	Y	HNO_3 pH<2	HDPE	1030

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)

* Assumes 30% porosity

Signature GPNaughton Date 2/18/93 No. of Bottles 6

Arthur D Little

Monitoring Well Sampling Data Sheet

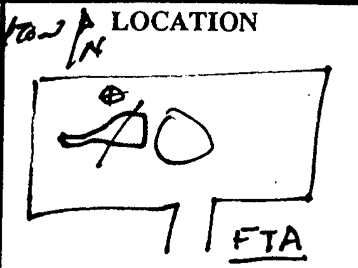
Well No. FTA-MW-3
Client USAEC
Project FT MEADE
Case No. 67069

Date Sampled: 2-18-93
Sampled By: FRIEDENSON/ELLINWOOD/NAUGHTON
Depth to Water: 4.70'
Total Depth: 15.89'

O2 20.9 | LEL 000 | PID 0.0

Measuring Point: DOUBLE NOTCH TOP OF RISER
Equipment: ORS INTERFACE PROBE, TEFLON BAIL

LOCATION



WELL VOLUME (* use appropriate values in table for each code letter)

V well [0.66] x [(Depth Screen Bottom [15.9] - Depth Water [4.7])] = Gallons of Water (well) [7.39]

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus [0.64] x [(Depth Screen Bottom [15.9] - Depth Bottom of Seal [5.0])] = Gallons of Water (annulus) [6.98]

WATER TO BE REMOVED

[(Gallons of Water (well) [7.4] + Gallons of Water (annulus) [7.0])] x Removal Multiplier [5] = Total Gallons to be Removed [72]

Actual Gallons Removed [85]

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
0850	0	5.02	.131	7.6	437
1000	85	5.06	.111	6.3	>999
Post Sampling					
1015	85	5.13	.105	7.0	>999

Well		Annulus*	
V well		dia	V annulus
1.5" 0.10gal/ft		4.0	0.29gal/ft
2" 0.17gal/ft		6.5	0.46gal/ft
		7.25	0.59gal/ft
		7.75	0.69gal/ft
		8.25	0.79gal/ft
4" 0.66gal/ft		8.25	0.64gal/ft
		10.25	1.06gal/ft
		12.25	1.63gal/ft
6" 1.5gal/ft		12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
F/MOOO3YV	VOA	40	N	HCl pH<2	AMBER	1010
3YS	SEMI VOA	1000	N		AMBER	1010
3YS	PETRO HYDRA	1000	N	H_2SO_4 pH<2	AMBER	1010
3YM	METALS	500	N	HNO_3 pH<2	HDPE	1010
3ZM	FILTERED METALS	500	Y	HNO_3 pH<2	HDPE	1010

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)

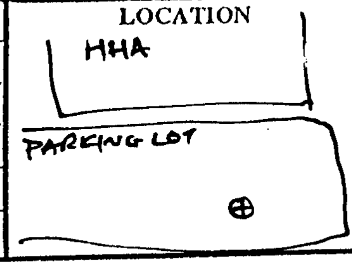
*Assumes 30% porosity

Signature GPNaughton Date 2/18/93 No. of Bottles 6

Appendix C: Helicopter Hangar Area Field Forms

Appendix C-1: Helicopter Hangar Area Soil Boring Logs and Monitoring Well Installation Logs

Arthur D Little	# Soil Boring Log	Boring No. HHA Client USAEC Project FT. MEADE Case No. 67069

		LOCATION
Date Start 1-29-93	Contractor ATEC	
Date Complete 2-1-93	Drill Method HOLLOW STEM AUGER	
Hole Diameter 1.1'	Type Of Rig MOBILE DRILL ATV B-53	
Casing Size 6" ID H.S. AUGER	Drilling Additives NONE	
Boring Depth 20'	Geologist G NAUGHTON	

Sampling Method 2"x2' SPLIT SPOON, 140 lb HAMMER, 30" DROP

Scale in Feet	SAMPLE Type and number	SAMPLE Interval	SAMPLE Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
0.0						
1.0	SS01 1300 HRS	0.0-2.0'	1.3'	12 19 20 22	2.4	[GM] SILTY SAND WITH GRAVEL LAYERS OF MODERATE REDDISH BROWN CLAY 10R 4/6 AND MODERATE YELLOWISH BROWN SILTY SAND 10YR 5/4 POORLY SORTED, DRY, LOOSE ASPHALT STAINS AND ODOR DIFFICULT TO CALL NATIVE SOIL BECAUSE OF ASPHALT STAINING AND GRAVELS
2.0						
3.0						
4.0						
5.0						
6.0	SS02	5-7'	1.4'	9 14 15 15	2.0	[GM] SILTY SAND WITH GRAVELS MODERATE YELLOWISH BROWN 10YR 5/4 POORLY SORTED, DRY, MEDIUM DENSE NO ODOR.
7.0						
8.0						
9.0 ∇						
10.0						
11.0	SS03	10-12'	0.9'	3 25 27 21	6.0	[GM] OLIVE GRAY 5Y 4/1 SAND, SILT, AND GRAVEL, SUBANGULAR, POORLY SORTED, WET, LOOSE [GP] SANDS AND GRAVEL, SUB-ANGULAR DENSE, POORLY SORTED, WET LIGHT BROWN 5YR 5/6
12.0						
13.0						

Arthur D Little	**Soil Boring Log** Continuation Page	Boring No. HHA Client Project Case No.

Scale in Feet	SAMPLE Type and number	Interval	Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
13.0						
14.0						
15.0	SS04	15-17	.4'	14 9 12 13	0 ppm	DIV [GP] Light brown, poorly sorted medium to coarse sand and subrounded gravel, wet; medium dense
16.0						
17.0						
18.0						
19.0						
20						
21						

Artlur D Little

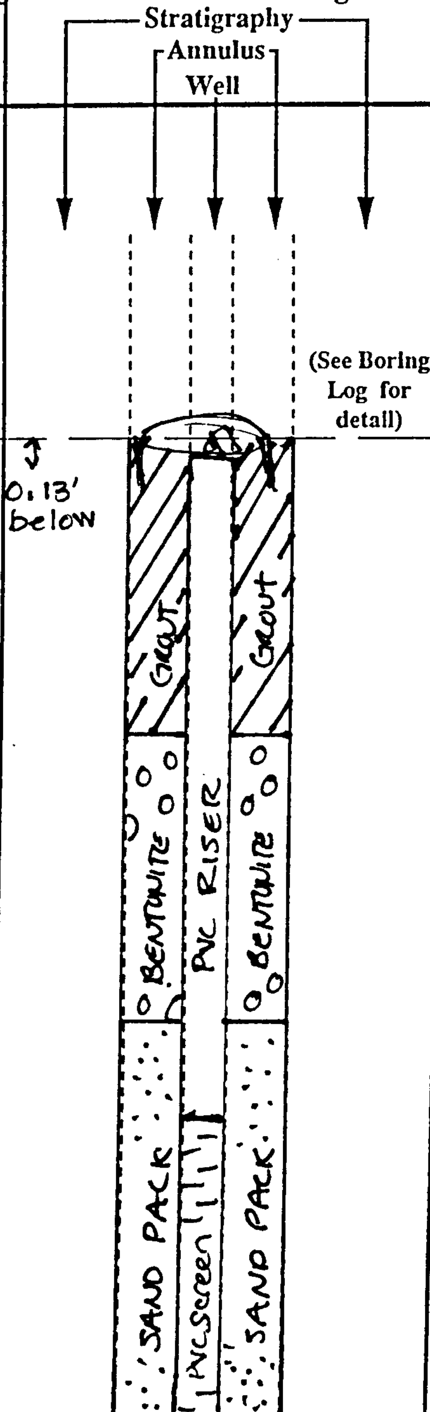
2-1-93 (DJV)

Monitoring Well Design

Boring No.	HHA-6
Client	USAEC
Project	FORT MEADE
Case No.	

Date Start ~~1-29-93~~	Date Complete 2-1-93	Hole Diameter 1.1'	Casing Size 6"
Contractor ATEC		Geologist G. Naughton, M. Greenwood	
Drill Method HOLLOW STEM AUGER		Boring Depth 20'	
Type Of Rig MOBILE DRILL ATV B-53		Grout method	
Datum Double notch on PVC riser		Development Method TO BE DEVELOPED	
Notes			

Scale in Feet	SAMPLE Type and number	SAMPLE Total Organics (ppm)	Well Construction Diagram	Construction Specifications



Scale: 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10

Elevation Top Of Casing ______

Elevation Top Of Riser Pipe ______

Elevation Ground Surface ______

(surveyed elevations)
(depth from ground surface)

Type of Surface Casing Flush Road box
I.D. Surface Casing 0.8'

Type Of Riser Pipe PVC
I.D. Riser Pipe ~~0.8'~~ 0.33'

Diameter Of Borehole 1.1'

Type Of Backfill NA

Type Of Seal Puregold Md. Chips-Bentonite
Depth To Top Of Seal 3'

Type Of Sand Pack Silica Quartz Sand
Depth To Top Of Sand Pack 6'

Type Of Screen PVC
Slot Size 0.010
I.D. Screen 0.4'
Screened Interval 17-7'

Depth To Bottom Of Well 17'

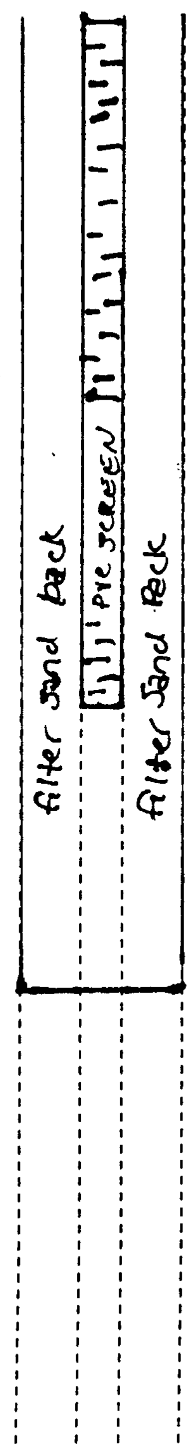
Depth To Bottom Of Borehole 20'

Arthur D Little

Monitoring Well Design
(Continuation Page)

Boring No.	HHA-
Client	USAEC
Project	Fort Meade
Case No.	

Scale in Feet	SAMPLE: Type and number	SAMPLE: Total Organics (ppm)	Well Construction Diagram (Stratigraphy / Annulus / Well)	Notes and Comments
10.0				
11.0				
12.0				
13.0				
14.0				
15.0				
16.0				
17.0				
18.0				
19.0				
20.0				

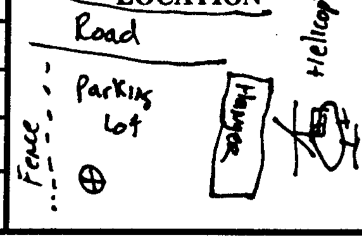


Appendix C-2: Helicopter Hangar Area Monitoring Well Development Logs

Arthur D Little	**Monitoring Well Development Data Sheet**	Well No. HHA MW-6 Client USAEC Project Ft Meade Case No. 67069

Date Developed: 2/18/93	Developed By: G. Naughton E. Friedman		
Depth to Water: 8.02	Total Depth: 17.03		
O^2 13.8	LEL 85%	HNu 6.4	
Measuring Point: V-notch on pvc riser			
Notes:			

LOCATION



WELL VOLUME (* use appropriate values in table for each code letter)

V well		Depth Screen Bottom		Depth Water		Gallons of Water (well)
.66	x [(	17.03	-	8.02	)] =	5.99

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annalus		Depth Screen Bottom		Depth Bottom of Seal		Gallons of Water (annalus)
1.06	x [(	17.03	-	3.0	)] =	14.57

WATER TO BE REMOVED

	Gallons of Water (well)		Gallons of Water (annulus)		Removal Multipier		Total Gallons to be Removed	Actual Gallons Removed
[(	5.99	+	14.17	)] x	5	=	120.30	121

MEASUREMENTS

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
1305	0.0 gallons	6.45	.440	~~11.9~~ 12.2	7999
1351	50	6.48	.409	12.3	7999
1437	100	6.51	.456	11.0	7999
1456	120	6.53	.494	10.9	7999

TABLE

Well	V well	Annalus * dia	V annalus
2"	0.17gal/ft	6.5	0.46gal/ft
		7.25	0.59gal/ft
		7.75	0.69gal/ft
		8.25	0.79gal/ft
4"	0.66gal/ft	8.25	0.64gal/ft
		10.25	1.06gal/ft
		12.25	1.63gal/ft
6"	1.5gal/ft	12.25	1.41gal/ft

Depth to Sediment: Before — After —

Type/Capacity of pump: hand baler (double baler)

Pumping Rate: 120 gallons / 111 minutes | Recharge Time —

Time to Develop Well: Start 1305 Finish 1456 Duration 111 minutes

COMMENTS (include description of water removed)

H_2S = 0 ppm
PID read 0.0 in bucket after 2 balers
" " 58.0 in well " "

1351 0.0 Breathing zone 16.3 in well. (PID)
water level ~~[illegible]~~ 8.21 feet after baling 1459

* Assumes 30% porosity for sand pack

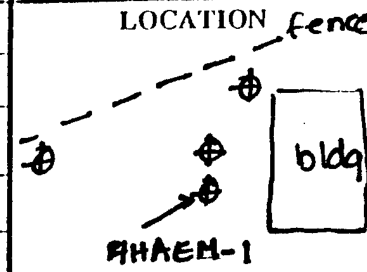
Appendix C-3: Helicopter Hangar Area Monitoring Well Sampling Logs

Arthur D Little

Monitoring Well Sampling Data Sheet

Well No. HHAEM-1
Client USAEC
Project FGGM
Case No. 67069

LOCATION



Date Sampled: 1/20/94 | Sampled By: Webber / Stover
Depth to Water: 5.63 ft. | Total Depth: 16.83 ft.

O_2 — | LEL — | PID 32.2 ppm

Measuring Point: North edge of PVC casing
Equipment: Horiba U-10, Microtip Pid

WELL VOLUME (* use appropriate values in table for each code letter)

V well [0.66] x [([16.83] Depth Screen Bottom - [5.63] Depth Water)] = [7.39] Gallons of Water (well)

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus [1.06] x [([16.83] Depth Screen Bottom - [6.83] Depth Bottom of Seal)] = [10.60] Gallons of Water (annulus)

WATER TO BE REMOVED

[([7.39] Gallons of Water (well) + [10.60] Gallons of Water (annulus))] x [5] Removal Multiplier = [89.95] Total Gallons to be Removed

Actual Gallons Removed [90]

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
1615	0	6.71	0.369	6.9	308
1845	90	6.91	0.304	9.3	80
Post Sampling 1900	90+	6.71	0.307	4.8	93

Well V well	Annulus* dia	Annulus* V annulus
1.5" 0.10gal/ft	4.0	0.29gal/ft
2" 0.17gal/ft	6.5	0.46gal/ft
	7.25	0.59gal/ft
	7.75	0.69gal/ft
	8.25	0.79gal/ft
4" 0.66gal/ft	8.25	0.64gal/ft
	10.25	1.06gal/ft
	12.25	1.63gal/ft
6" 1.5gal/ft	12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
HHAEM-1	VOC	2 x 40mL	N	HCl	glass vial	1830
↓	SVOC	1 L	↓	ice	glass	↓
↓	Metals	500 mL	↓	HNO_3	HDPE	↓
↓	PHC	1 L	↓	HCl	glass	↓
↓	Metals	500 mL	Y	HNO_3	HDPE	

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)
strong odor, water initially black, turned gray; sheen, broken syringe glass in bailer; drummed purge water
breathing space PID = bkg

* Assumes 30% porosity

Signature Dorothy J Vemper Date 1/20/94 No. of Bottles 6

Depth of screen bottom derived from total depth measurement

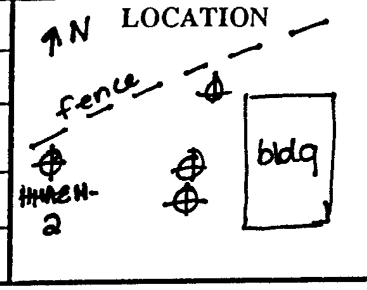
Arthur D Little	**Monitoring Well Sampling Data Sheet**	Well No. HHAEM-2 Client USAEC Project FGGM Case No. 67069

Date Sampled: 1/20/94	Sampled By: Vesper/Greenwood	LOCATION
Depth to Water: 7.9'	Total Depth: 16.59'	

O_2 —	LEL —	PID 0.2 ppm

Measuring Point: North edge of casing

Equipment: Horiba U-10, Microtip Pid



WELL VOLUME (* use appropriate values in table for each code letter)

V well		Depth Screen Bottom		Depth Water		Gallons of Water (well)
0.66 gal/ft	x [(	17.25 ft.	-	7.9 ft.	)] =	6.17 gal

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus		Depth Screen Bottom		Depth Bottom of Seal		Gallons of Water (annulus)
1.06 gal/ft	x [(	17.25 ft.	-	~~0~~7.25 ft.	)] =	10.60 gal

WATER TO BE REMOVED

	Gallons of Water (well)		Gallons of Water (annulus)		Removal Multipler		Total Gallons to be Removed	Actual Gallons Removed
[(	6.17	+	10.60	)] x	5	=	83.85	90

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
0945	0	5.88	1.58	8.4	>999
1240	90	6.31	0.104	10.6	>900
Post Sampling 1300	90+	6.04	0.094	10.5	>999

Well		Annulus*	
	V well	dia	V annulus
1.5"	0.10gal/ft	4.0	0.29gal/ft
2"	0.17gal/ft	6.5	0.46gal/ft
		7.25	0.59gal/ft
		7.75	0.69gal/ft
		8.25	0.79gal/ft
4"	0.66gal/ft	8.25	0.64gal/ft
		10.25	1.06gal/ft
		12.25	1.63gal/ft
6"	1.5gal/ft	12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
HHAEM-2	VOC	2 x 40mL	N	HCl	G	1245
	SVOC	1000	N	ice	G	↓
	Metals	500	N	HNO_3	P	↓
	PHC	1000	N	HCl	G	↓
	Metals	500	Y	HNO_3	P	↓

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)
ground water initially black, cleared later

* Assumes 30% porosity

Signature Dorothy J Vesper Date 1/20/94 No. of Bottles 6

Arthur D Little

Monitoring Well Sampling Data Sheet

Well No. HHAEM-3
Client USAEC
Project FGGM
Case No. 67069

Date Sampled: 1/20/94 | Sampled By: Vesper/Greenwood

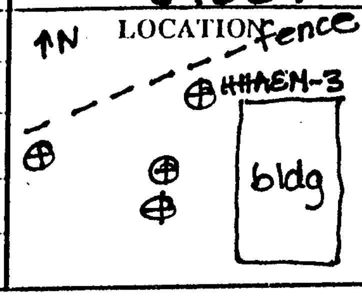
Depth to Water: 8.17 ft. | Total Depth: 19.43 ft.

O_2 — | LEL — | PID 30.8 ppm (bkg in bspace)

Measuring Point: North edge of PVC casing

Equipment: Horiba U-10, Microtip Pid

LOCATION



WELL VOLUME (* use appropriate values in table for each code letter)

V well		Depth Screen Bottom		Depth Water		Gallons of Water (well)
0.66	x [(	19.43	-	8.17	)] =	7.43

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus		Depth Screen Bottom		Depth Bottom of Seal		Gallons of Water (annulus)
1.06	x [(	19.43	-	9.43	)] =	10.60

WATER TO BE REMOVED

	Gallons of Water (well)		Gallons of Water (annulus)		Removal Multiplier		Total Gallons to be Removed	Actual Gallons Removed
[(	7.43	+	10.60	)] x	5	=	90.15	95

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
0945	0	5.88	1.58	8.4	>999
1630	95	6.51	0.208	9.3	59
Post Sampling 1700	95+	6.47	0.197	9.2	6

Well V well	Annulus* dia	Annulus* V annulus
1.5" 0.10gal/ft	4.0	0.29gal/ft
2" 0.17gal/ft	6.5	0.46gal/ft
	7.25	0.59gal/ft
	7.75	0.69gal/ft
	8.25	0.79gal/ft
4" 0.66gal/ft	8.25	0.64gal/ft
	10.25	1.06gal/ft
	12.25	1.63gal/ft
6" 1.5gal/ft	12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
						1700
HHAEM-3	VOCs	2 x 40	N	HCl	G	↓
	SVOCs	1000	N	ice	G	
	Metals	500	N	HNO_3	P	
	Metals	500	Y	HNO_3	P	
	PHC	1000	N	HCl	G	

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)

strong odor; sheen; initially black, clear by end
drummed purge water

* Assumes 30% porosity

Signature Dorothy J. Vesper Date 1/20/94 No. of Bottles 6

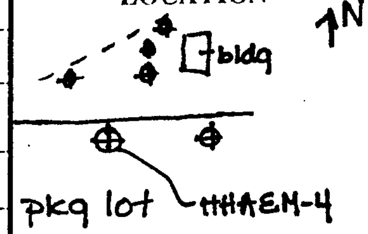
Depth of screen bottom derived from total depth

Arthur D Little

Monitoring Well Sampling Data Sheet

Well No. HHA EM-4
Client USAEC
Project FGGM
Case No. 67069

LOCATION



Date Sampled: 1/20/94	Sampled By: Webber/Stover
Depth to Water: 6.83 ft.	Total Depth: 15.96

O_2	LEL	PID

Measuring Point: North edge of PVC casing

Equipment: Horiba U-10, Microtip Pid

WELL VOLUME (* use appropriate values in table for each code letter)

V well [0.66] x [(Depth Screen Bottom [45] - Depth Water [6.83])] = Gallons of Water (well) [25.19]

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus [1.06] x [(Depth Screen Bottom [45] - Depth Bottom of Seal [35])] = Gallons of Water (annulus) [10.60]

WATER TO BE REMOVED

[(Gallons of Water (well) [25.19] + Gallons of Water (annulus) [10.60])] x Removal Multiplier [5] = Total Gallons to be Removed [178.95]

Actual Gallons Removed [180]

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
0830	0	5.85	0.39	2.3	0.0
1016	90	6.28	0.428	11.5	10
1150	190	6.26	0.453	10.8	7999
Post Sampling 1220	190+	6.41	0.456	10.7	7999

Well	V well	Annulus* dia	V annulus
1.5"	0.10gal/ft	4.0	0.29gal/ft
2"	0.17gal/ft	6.5	0.46gal/ft
		7.25	0.59gal/ft
		7.75	0.69gal/ft
		8.25	0.79gal/ft
4"	0.66gal/ft	8.25	0.64gal/ft
		10.25	1.06gal/ft
		12.25	1.63gal/ft
6"	1.5gal/ft	12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
HHAEM-4	VOCs	2x40	N	HCl	G	1145
	SVOCs	1000	N	Ice	G	
	Metals	500	N	HNO_3	P	
	Metals	500	Y	"	P	
	PHC	1000	N	HCl	G	

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)
brown initially, turns clear

* Assumes 30% porosity

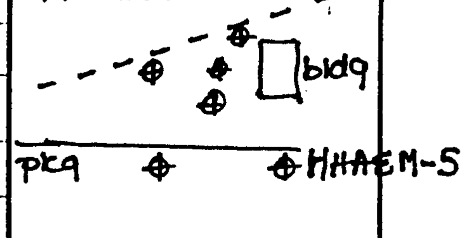
Signature Dorothy J. Vo[illegible] Date 1/20/94 No. of Bottles 6

Arthur D Little

Monitoring Well Sampling Data Sheet

Well No. HHA EM-5
Client USAEC
Project FGGM
Case No. 67069

LOCATION



Date Sampled: 1/20/94 | Sampled By: Greenwood/Stover

Depth to Water: 4.0 ft. | Total Depth: 17.82 ft.

O_2 — | LEL — | PID 7.5 ppm bkg in bspace

Measuring Point: North edge of PVC casing

Equipment: Horiba U-10, Microtip Pid

WELL VOLUME (* use appropriate values in table for each code letter)

V well		Depth Screen Bottom		Depth Water		Gallons of Water (well)
0.66	x [(	17.82	-	4.0	)] =	9.12

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus		Depth Screen Bottom		Depth Bottom of Seal		Gallons of Water (annulus)
1.06	x [(	17.82	-	7.82	)] =	10.60

WATER TO BE REMOVED

	Gallons of Water (well)		Gallons of Water (annulus)		Removal Multipler		Total Gallons to be Removed	Actual Gallons Removed
[(	9.12	+	10.60	)] x	5	=	98.60	100

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
0945	0	6.33	0.289	7.0	283
1700	100	6.52	0.361	6.1	749
Post Sampling 1730	100+	6.65	0.388	8.1	267

Well V well	Annulus* dia	Annulus* V annulus
1.5" 0.10gal/ft	4.0	0.29gal/ft
2" 0.17gal/ft	6.5	0.46gal/ft
	7.25	0.59gal/ft
	7.75	0.69gal/ft
	8.25	0.79gal/ft
4" 0.66gal/ft	8.25	0.64gal/ft
	10.25	1.06gal/ft
	12.25	1.63gal/ft
6" 1.5gal/ft	12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
HHAEM-5	VOC	2x40	N	HCl	G	1730
	SVOC	1000	N	Ice	G	↓
	Metals	500	N	HNO_3	P	↓
	Metals	500	Y	HNO_3	P	↓
	PHC	1000	N	HCl	G	↓

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)
odor; water orange/rust through most of sampling
drummed purge water

* Assumes 30% porosity

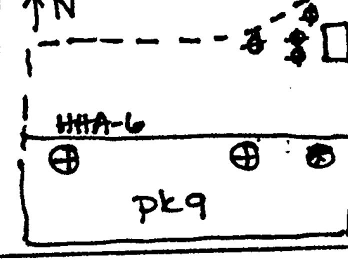
Signature Dorothy J Vesper Date 1/20/94 No. of Bottles 6

Depth of screen bottom derived from total depth

Arthur D Little	**Monitoring Well Sampling Data Sheet**	Well No. HHA-6 Client USAEC Project FGGM Case No. 67069

Date Sampled: 1/20/94	Sampled By: Webber/Stover	
Depth to Water: 8.06 ft.	Total Depth: 16.79 ft.	
O_2 —	LEL —	PID 28.2 ppm bkg in bspace

LOCATION



Measuring Point: North edge of PVC casing

Equipment: Horiba U-10, Microtip Pid

WELL VOLUME (* use appropriate values in table for each code letter)

V well		Depth Screen Bottom		Depth Water		Gallons of Water (well)
0.66	x [(	16.79	-	8.06	)] =	5.76

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus		Depth Screen Bottom		Depth Bottom of Seal		Gallons of Water (annulus)
1.06	x [(	16.79	-	6.79	)] =	10.60

WATER TO BE REMOVED

	Gallons of Water (well)		Gallons of Water (annulus)		Removal Multipler		Total Gallons to be Removed	Actual Gallons Removed
[(	5.76	+	10.60	)] x	5	=	81.80	85

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
1425	0	6.49	0.407	10.7	8
1500	45	6.41	0.403	11.8	40
1520	85	6.48	0.428	8.5	87
Post Sampling 1540	85+	6.47	0.444	11.6	344

Well		Annulus*	
	V well	dia	V annulus
1.5"	0.10gal/ft	4.0	0.29gal/ft
		6.5	0.46gal/ft
2"	0.17gal/ft	7.25	0.59gal/ft
		7.75	0.69gal/ft
		8.25	0.79gal/ft
4"	0.66gal/ft	8.25	0.64gal/ft
		10.25	1.06gal/ft
		12.25	1.63gal/ft
6"	1.5gal/ft	12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
						1550
HHA-6	VOC	2 x 40	N	HCl	G	↓
	SVOC	1000	N	Ice	G	
	Metals	500	N	HNO_3	P	
	Metals	500	Y	HNO_3	P	
	PHC	1000	N	HCl	G	

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)

strong odor, sheen; clear entire time
drummed purge water

* Assumes 30% porosity

Signature Dorothy J. Vaughn(?)   Date 1/20/94   No. of Bottles 6

Depth of screen bottom derived from total depth measurement.

Appendix C-4: Helicopter Hangar Area Surface Water Sampling Logs

Arthur D Little

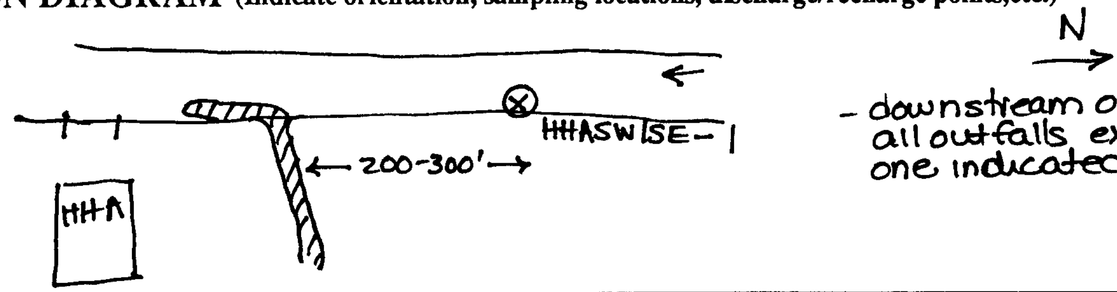
Surface Water/Sediment Sampling Data Sheet

Date 1/21/94
Client USAEC
Project FGGM
Case No. 67069

LOCATION

Sampling Location Discription HHA/Little Patuxent River HHASW/SE-1
Type Of Water Body river
Channel Width — Channel Depth ____ Est. Flow —
Discharge Points (Y/N) N Location ____
Odors, Surface Sheen none

LOCATION DIAGRAM (Indicate orientation, sampling locations, discharge/recharge points,etc.)



- downstream of all outfalls except one indicated

SAMPLING PROCEDURE

Equipment Used (Calibrated Y/N) Horiba U-10
Solvent 1 Used ____ Solvent 2 Used ____ Other ____
Decontamination Procedures Used

- [ ] DI Water Rinse / Solvent 1 Rinse / Solvent 2 Rinse / Solvent 1 Rinse / DI Water Rinse
- [ ] DI Water Rinse / Solvent 1 Rinse / DI Water Rinse
- [ ] Detergent Wash / DI Water Rinse
- [x] Other

GROUND WATER CHARACTERISTIC

TEMP	pH	COND	D.O.	FREE CL^- Y/N	TURB	TIME
0.7	6.92	0.590	11.83	—	128	1600

SAMPLING

SAMPLE	MATRIX	METHOD	VOLUME (ml)	FILTERED (Y/N)	PRESERV.	TIME
HHASW-1 : VOCs	Aq	Grab	2x 40	N	HCl	1600
: SVOCs	↓	↓	1000	↓	SVOC ice	↓
: Metals	↓	↓	500	↓	HNO_3	↓
: PHC	↓	↓	1000	↓	HCl	↓
HHASE-1 : VOCs	Sediment	↓	2 ounces	↓	ice	↓
SVOCs	↓	Composite	8 "	↓	↓	↓
Metals	↓	↓	8	↓	↓	↓
PHC	↓	↓	8	↓	↓	↓

NOTES - Numerous outfalls were noted from the WWTP upstream of the sampling point. Soap suds were visible in some of the discharges and in a couple places along the river.
- equipment blank 94QC-257 collected of auger/bowl/spoon afterward

Signature Dorothy J. Vasper Date 1/21/94 No. Of Bottles 9

Arthur D Little

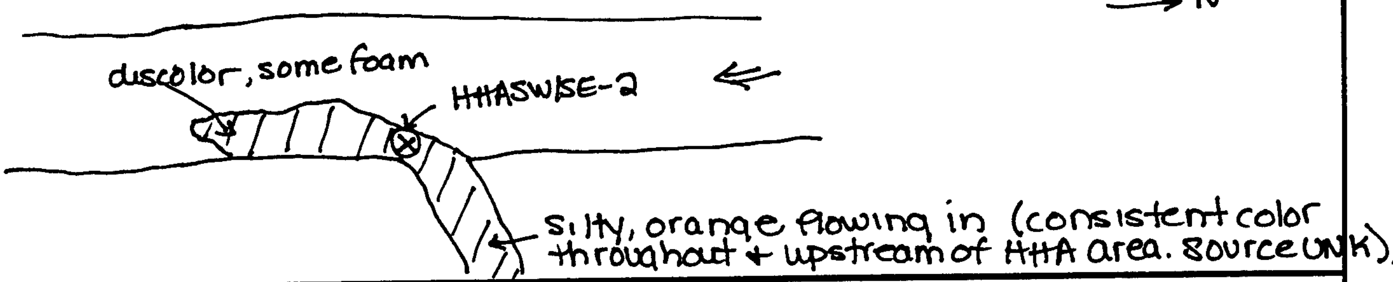
Surface Water/Sediment Sampling Data Sheet

Date 1/21/94
Client USAEC
Project F66M
Case No. 67069

LOCATION

Sampling Location Discription HHA / Little Patuxent River HHASW/SE-2
Type Of Water Body river
Channel Width – Channel Depth 0.4 ft Est. Flow –
Discharge Points (Y/N) Location
Odors, Surface Sheen discolored (orangish) from side stream

LOCATION DIAGRAM (Indicate orientation, sampling locations, discharge/recharge points,etc.)



SAMPLING PROCEDURE

Equipment Used (Calibrated Y/N) Horiba U-10
Solvent 1 Used Solvent 2 Used Other
Decontamination Procedures Used

☐ DI Water Rinse, Solvent 1 Rinse, Solvent 2 Rinse, Solvent 1 Rinse, DI Water Rinse

☐ DI Water Rinse, Solvent 1 Rinse, DI Water Rinse

☐ Detergent Wash, DI Water Rinse

☒ Other

GROUND WATER CHARACTERISTIC

TEMP	pH	COND	D.O.	FREE CL^- Y/N	TURB	TIME
1.2	7.04	1.29	19.99	–	90	1500

SAMPLING

SAMPLE	MATRIX	METHOD	VOLUME (ml)	FILTERED (Y/N)	PRESERV.	TIME
HHASW-2: VOCs	Aq	Grab	2 x 40	N	HCl	1500
SVOCs	↓	↓	1000	↓	Ice	↓
Metals			500		HNO_3	
PHC			1000		HCl	
HHASE-2: VOCs	sediment	Grab	2 ounces	N	ice	1500
SVOCs	↓	Composite	8	↓	↓	↓
Metals		↓	8			
PHC			8			

NOTES

sample collected along edge of discolored area.

Signature Dorothy J. Kasper Date 1/21/94 No. Of Bottles 9

Page 1 of 1

Arthur D Little	Surface Water/Sediment Sampling Data Sheet	Date 1/21/94
		Client USAEC
		Project FGGM
		Case No. 67069

LOCATION

Sampling Location Discription HHA/Little Patuxent River HHASW/SE-3

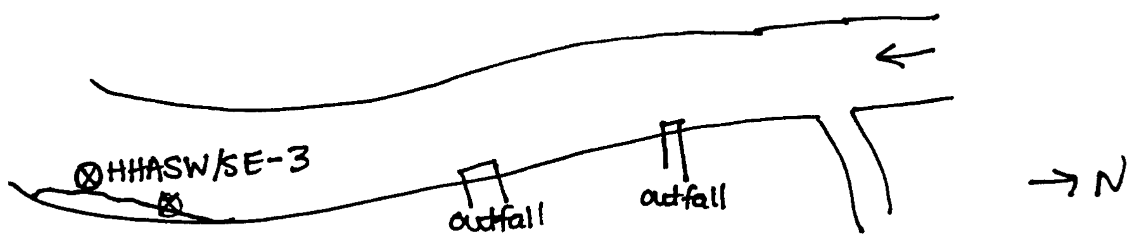
Type Of Water Body river

Channel Width ______ Channel Depth 1.5 ft Est. Flow —

Discharge Points (Y/N) N Location ______

Odors, Surface Sheen None

LOCATION DIAGRAM (Indicate orientation, sampling locations, discharge/recharge points,etc.)



SAMPLING PROCEDURE

Equipment Used (Calibrated Y/N) Y HORIBA U-10

Solvent 1 Used ______ Solvent 2 Used ______ Other ______

Decontamination Procedures Used

- [ ] DI Water Rinse, Solvent 1 Rinse, Solvent 2 Rinse, Solvent 1 Rinse, DI Water Rinse
- [ ] DI Water Rinse, Solvent 1 Rinse, DI Water Rinse
- [ ] Detergent Wash, DI Water Rinse
- [x] Other

GROUND WATER CHARACTERISTIC

TEMP	pH	COND	D.O.	FREE CL⁻ Y/N	TURB	TIME
0.7	6.78	0.782	14.4	—	31	1200

SAMPLING

SAMPLE	MATRIX	METHOD	VOLUME (ml)	FILTERED (Y/N)	PRESERV.	TIME
HHASW-3 (VOCs)	AQ	Grab	2x40	N	HCl	1220
(SVOCs)	↓	↓	1000	↓	Ice	↓
(Met)	↓	↓	500	↓	HNO3	↓
(PHC)	↓	↓	1000	↓	HNO3	↓
HHASE-3 (VOCs)	Sediment	Grab	2 oz	↓	Ice	↓
(SVOCs)	↓	Composite	4 oz	↓	↓	↓
(Met)	↓	↓	4 oz	↓	↓	↓
(PHC)	↓	↓	4 oz	↓	↓	↓

NOTES Sample (aqueous) collected approx 100 ft downstream from outfall of oil-water seperator. Sediment collected about 50 feet down from outfall because no sediment was found at sorface water location.

Signature [signature] Date 1/21/94 No. Of Bottles 9

Arthur D Little

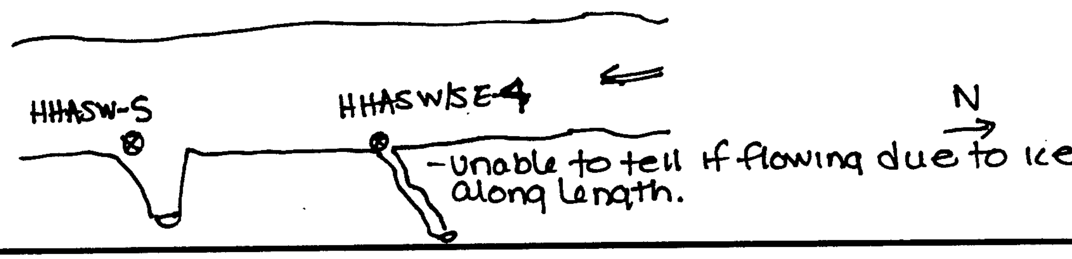
Surface Water/Sediment Sampling Data Sheet

Date 1/21/94
Client USAEC
Project FGGM
Case No. 67069

LOCATION

Sampling Location Discription HHA/Little Patuxent River HHASW/SE-4
Type Of Water Body outfall to river
Channel Width — Channel Depth 0.5 ft Est. Flow —
Discharge Points (Y/N) Location discharge from unknown outfall
Odors, Surface Sheen —

LOCATION DIAGRAM (Indicate orientation, sampling locations, discharge/recharge points,etc.)



SAMPLING PROCEDURE

Equipment Used (Calibrated (Y)/N) Horiba U-10
Solvent 1 Used ____ Solvent 2 Used ____ Other ____
Decontamination Procedures Used

- [ ] DI Water Rinse / Solvent 1 Rinse / Solvent 2 Rinse / Solvent 1 Rinse / DI Water Rinse
- [ ] DI Water Rinse / Solvent 1 Rinse / DI Water Rinse
- [ ] Detergent Wash / DI Water Rinse
- [X] Other

GROUND WATER CHARACTERISTIC

TEMP	pH	COND	D.O.	FREE CL⁻ Y/N	TURB	TIME
0.2	6.97	0.605	14.13	—	100	1300

SAMPLING

SAMPLE	MATRIX	METHOD	VOLUME (ml)	FILTERED (Y/N)	PRESERV.	TIME
HHASW-4 (VOCs)	Aq	Grab	40 x 2	N	HCl	1300
(SVOCs)	↓	↓	1000	↓	Ice	↓
(Met)	↓	↓	500	↓	HNO_3	↓
(PHC)	↓	↓	1000	↓	HCl	↓
HHASE-4 (VOCs)	Sedim.	↓	2 ounce	↓	Ice	↓
(SVOCs)	↓	Composite	8 "	↓	↓	↓
(Met)	↓	↓	8 "	↓	↓	↓
(PHC)	↓	↓	8 "	↓	↓	↓
94QC-402 (VOCs)	↓	Grab	2	↓	↓	↓
(SVOCs)	↓	Composite	8	↓	↓	↓
(Met)	↓	↓	8	↓	↓	↓
(PHC)		↓	8	↓	↓	↓

NOTES Sample 94QC-402 is a duplicate of HHASE-4

Signature Dorothy J. Hooper Date 1/21/94 No. Of Bottles 13

Arthur D Little

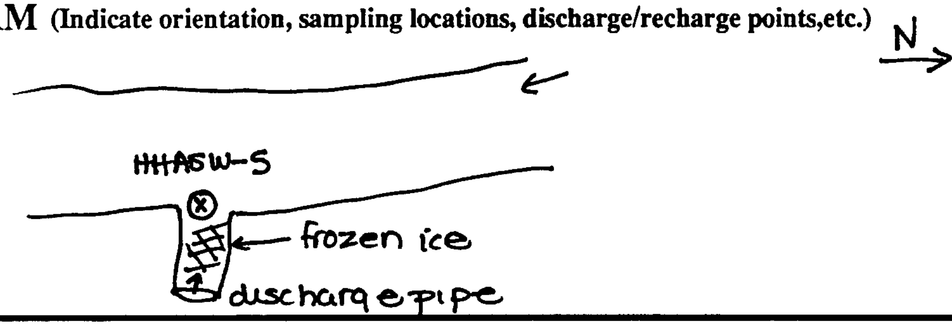
Surface Water/Sediment Sampling Data Sheet

Date 1/21/94
Client USAEC
Project FGGM
Case No. 67069

LOCATION

Sampling Location Discription HHA/Little Patuxent River HHASW-5
Type Of Water Body outfall discharge into river
Channel Width — Channel Depth 1 ft Est. Flow — ~~discharge flowing at 1-5 gpm~~
Discharge Points (Y/N) Y Location just down from outfall from the oil-water seperator
Odors, Surface Sheen discharge colored orange

LOCATION DIAGRAM (Indicate orientation, sampling locations, discharge/recharge points,etc.)



SAMPLING PROCEDURE

Equipment Used (Calibrated Y/N) Y Horiba U-10
Solvent 1 Used ______ Solvent 2 Used ______ Other ______
Decontamination Procedures Used

- [ ] DI Water Rinse, Solvent 1 Rinse, Solvent 2 Rinse, Solvent 1 Rinse, DI Water Rinse
- [ ] DI Water Rinse, Solvent 1 Rinse, DI Water Rinse
- [ ] Detergent Wash, DI Water Rinse
- [X] Other

GROUND WATER CHARACTERISTIC

TEMP	pH	COND	D.O.	FREE CL^- Y/N	TURB	TIME
0.6	6.80	0.613	13.44	—	106	1240

SAMPLING

SAMPLE	MATRIX	METHOD	VOLUME (ml)	FILTERED (Y/N)	PRESERV.	TIME
HHASW-5 (VOCs)	Aq	Grab	40×2	N	HCl	1240
(SVOCs)	↓	↓	1000	↓	ice	↓
(Met)	↓	↓	500	↓	HNO_3	↓
(TPHC)	↓	↓	1000	↓	HCl	↓

NOTES No sediment sample was collected (HHASE-5) because no sediment was found at the sampling point

Signature Dorothy J. Vogler Date 1/21/94 No. Of Bottles 5

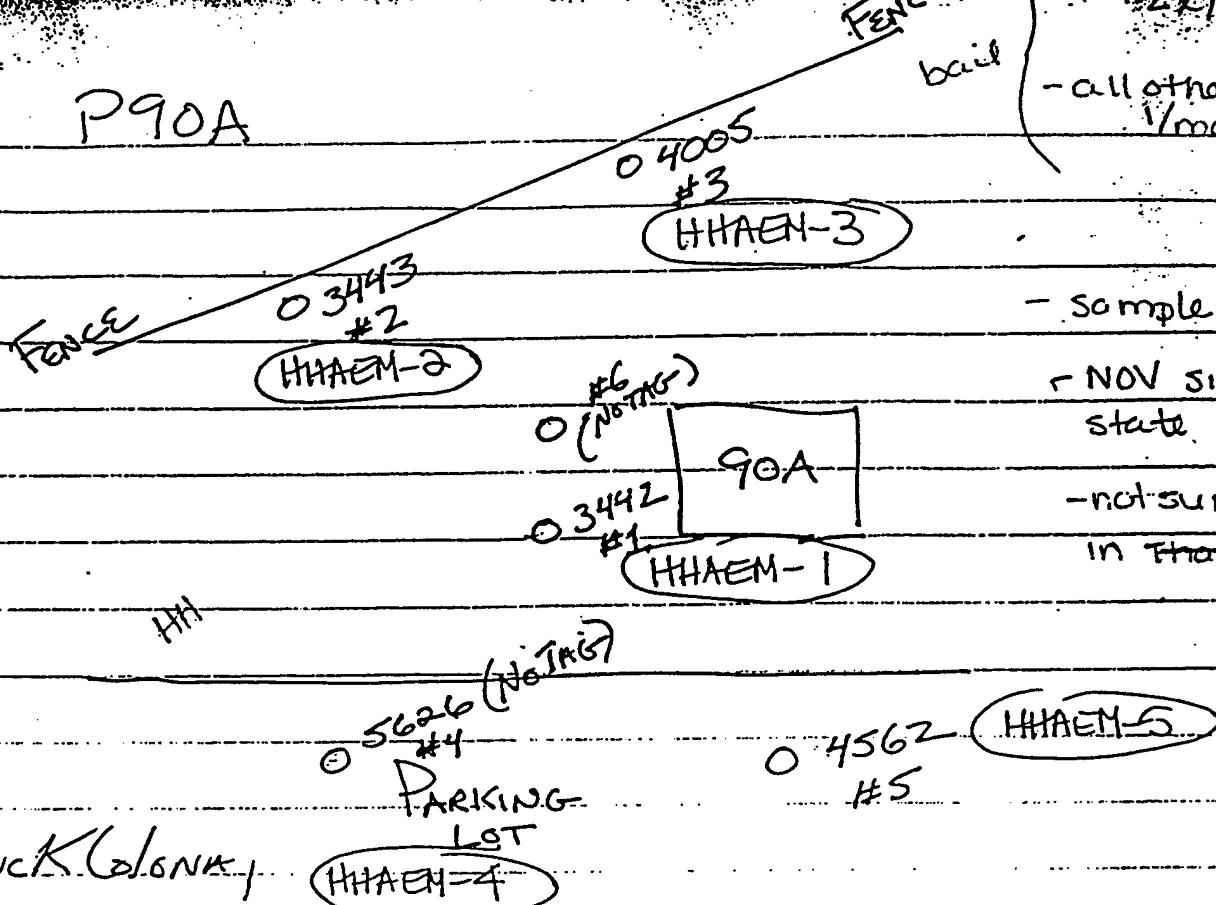
Appendix C-5: EMO Well Data for the Helicopter Hangar Area

BO
EGGM Environ Mgt Office

P90A

- 344[illegible]
2x/mo
bail
- all others 1/mon

- sample qtr
- NOV site state
- not sure if in the IRDMIS



Chuck Colona,

For the purpose of monitoring the groundwater wells at P90A, ~~the tags w/ on~~ the wells with no tag will be refered to as well #6 (well next to well 3442) & well #4, 5626 (well in the parking lot).

Chuck, plz pass a copy of this on to MKM.

Thanks
Pete

c.c. FRANK KING
KODI IRANI

JONES WELL DRILLING, INC.

3709 RUSH ROAD
JARRETTSVILLE, MARYLAND 21084

Jan 92-
off to recharge
-keep off

ORING LOG

Well No. #1 Application No. ______ Permit No. AA-88-3442
Date Drilled 11-02-89 County Anne Arundel Use ______
Location Bldg. 90 A Helicopter Hanger Airfield Rd.
Owner Ft. Meade/G.W. Over Address ______
Drilling Method Augered Sampling Method Cuttings
Hole Diameter 11" Total Depth 16' 10"
Casing:
Type Shur-seal flush joint sch. 40 PVC Diameter 4" Length 1' 10"
Screen:
Type Shur-seal flush joint sch. 40 PVC Slot .020 Diameter 4" Length 15' 0"
Gravel Pack Size #1 Casing Seal Bentonite
Static Water Level 8' 10" Geologic Formation Potomac Group

DEPTH BELOW SURFACE	SAMPLE NUMBER	BLOWS PER 6" ON SAMPLER	WELL DESIGN	IDENTIFICATION OF SOILS/REMARKS
			Casing	0' - 6" Brown dirt
			Well screen	6" - 3' Sand
				3' - 5' Gravel
				5' - 11' Sand & gravel
				11' - 14' Brown/red clay
				14' - 17' White clay
10'				
20'				
30'				

LTHAEM-1
~~MW~~

JONES WELL DRILLING, INC.
3700 RUSH ROAD
JARRETTSVILLE, MARYLAND 21084

BORING LOG

Well No. #2 Application No. ____ Permit No. AA-88-3443
Date Drilled 11/02/89 County Anne Arundel Use Monitoring
Location Bldg. 90-A Helicopter Hanger Airfield Rd
Owner Ft. Meade/C.W. Over Address ____
Drilling Method Augered Sampling Method Cuttings
Hole Diameter 11" Total Depth 17' 3"
Casing: Type Shur-seal flush joint sch 40 PVC Diameter 4" Length 2'3"
Screen: Type Shur-seal flush joint sch 40 PVC Slot .020 Diameter 4" Length 15' 0"
Gravel Pack Size #1 Casing Seal Bentonite
Static Water Level 9'2" Geologic Formation Potomac Group

DEPTH BELOW SURFACE	SAMPLE NUMBER	BLOWS PER 6" ON SAMPLER	WELL DESIGN	IDENTIFICATION OF SOILS/REMARKS
			Casing	0' - 6" Brown dirt
				6" - 2' Soft brown
			Well Screen	2' - 4' Gray clay (slight fumes)
				4' - 6' Gravel
				6' - 13' Sand & gravel
				13' - 17' 6" Brown clay
10'				
20'				
30'				

HHAEM-2

1 F 30151 SEQUENCE NO. (DENV USE ONLY)
THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER HHAEM-1

PERMIT NO. FROM "PERMIT TO DRILL WELL" AA-83-5626

ST/CO USE ONLY DATE Received

DATE WELL COMPLETED 0 1 2 9 1

Depth of Well 45 (TO NEAREST FOOT)

OWNER C.W. Over Contracting Company/Fort Meade first name TOWN Jarrettsville 21084

STREET OR RFD 1367 Roe Ridge Rd.

SUBDIVISION Fort Meade Bldg. 90-A Airfield Rd. SECTION LOT

WELL LOG

Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	Check if water bearing
brown dirt	0	1½	
gray clay (petro. odor)	1½	3	
tan clay mixed with gravel (strong petro. odor)	3	4	
gray clay	4	6	
tan clay mixed with gravel (strong petro. odor)	6	8	x
brown clay with fine sand	8	30	x
[illegible] clay	30	39	
[illegible]ay	39	46	

CIRCLE APPROPRIATE LETTER

A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED

E ELECTRIC LOG OBTAINED

P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS IDENT. NO. 304

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION) David Kelly

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD

WELL HAS BEEN GROUTED (Circle Appropriate Box) yes Y no N

TYPE OF GROUTING MATERIAL CEMENT CM BENTONITE CLAY BC

NO. OF BAGS 1 NO. OF POUNDS 50

GALLONS OF WATER 21

DEPTH OF GROUT SEAL (to nearest foot) from 0 ft. (TOP) to 3 ft. (BOTTOM) (enter 0 if from surface)

CASING RECORD

casing types insert appropriate code below: ST STEEL, CO CONCRETE, PL PLASTIC, OT OTHER

MAIN CASING TYPE: PL — Nominal diameter top (main) casing (nearest inch): 4 — Total depth of main casing (nearest foot): 5

OTHER CASING (if used) diameter inch, depth (feet) from to

SCREEN RECORD

screen type or open hole insert appropriate code below: ST STEEL, BR BRASS BRONZE, HO OPEN HOLE, PL PLASTIC, OT OTHER

C2

EACH SCREEN — DEPTH (nearest ft.)

Type	From	To
PL	5	45

SLOT SIZE .020

DIAMETER OF SCREEN 4 (NEAREST INCH)

GRAVEL PACK from 3 to 46

IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

OEP USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T TELESCOPE CASING — (E.R.O.S.) LOG INDICATOR — W Q OTHER DATA

C3 PUMPING TEST

HOURS PUMPED (nearest hour) 3

PUMPING RATE (gal. per min. to nearest gal.) 4

METHOD USED TO MEASURE PUMPING RATE timer

WATER LEVEL (distance from land surface) BEFORE PUMPING 7 WHEN PUMPING 43

TYPE OF PUMP USED (for test): A air, P piston, T turbine, C centrifugal, R rotary, O other (describe below), J jet, S submersible

PUMP INSTALLED

DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) YES NO

IF DRILLER INSTALLS PUMP; THIS SECTION MUST BE COMPLETED FOR ALL WELLS EXCEPT HOME USE

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX - SEE ABOVE:

CAPACITY: GALLONS PER MINUTE (to nearest gallon)

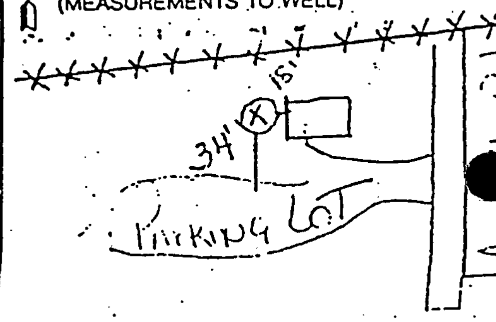
PUMP HORSE POWER

PUMP COLUMN LENGTH (nearest ft.)

CASING HEIGHT (circle appropriate box and enter casing height) + above − below LAND SURFACE 0 (nearest foot)

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND/OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



DRILLER

BORING LOG

Well No. ______ Application No. ______ Permit No. AA-88-5626

Date Drilled 01-21-91 County Anne Arundel Use Monitoring

Location Fort Meade Bldg. 90-A Airfield Rd.

Owner C.W. Over/Fort Meade Address Jarrettsville

ING METHOD
Augered

ING METHOD
ittings

DIAMETER
11"

DEPTH 45'

G PVC Schedule 40
ETER 4"
TH 5'

N
F PVC Schedule 40
.020
ER 4"
IGTH 40'

L PACK SIZE #1

C WATER LEVEL
7

IG SEAL
onite/cement

GIC FORMATION

DEPTH BELOW	SAMPLE NUMBER	BLOWS PER 6" ON SAMPLER	WELL DESIGN	IDENTIFICATION OF SOIL/REMARKS
			Casing	0 - 1½ brown dirt
				1½ - 3 gray clay (petro. odor)
				3 - 4 tan clay mixed with gravel (strong petro. odor)
				4 - 6 gray clay
				6 - 8 tan clay mixed with gravel (strong petro. odor) x water bearing
10'				
20'				
30'				8 - 30 brown clay with fine sand x water bearing
				30 - 39 brown clay
40'				
45'				39 - 46 red clay

1HAAEM-4

JONES WELL DRILLING, INC.
(301) 692-6981 office
(301) 692-9635 evening
(301) 692-6969 FAX
3700 Rush Road
Jarrettsville, MD 21084

Appendix D: Inactive Landfill #2 Monitoring Well Sampling Logs

Arthur D Little

Monitoring Well Sampling Data Sheet

Well No. MW-27 (IL2)
Client USAEC
Project FT. MEADE
Case No. 67069

Date Sampled: 2-17-93 | Sampled By: FRIEDENSON/NAUGHTON
Depth to Water: 12.58' | Total Depth: 31.61'
O_2 21.0 | LEL 000 | PID 0.0
Measuring Point: BLACK MARK TOP OF RISER
Equipment: KECK SUBMERSIBLE PUMP

LOCATION
PN
MW 27
FENCE
IL2
ROAD

WELL VOLUME (* use appropriate values in table for each code letter)

V well [0.66] x [([Depth Screen Bottom 31.6] - [Depth Water 12.6])]= [Gallons of Water (well) 12.5]

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus [0.64] x [([Depth Screen Bottom 31.6] - [Depth Bottom of Seal 10.5])]= [Gallons of Water (annulus) 13.5]

WATER TO BE REMOVED

[([Gallons of Water (well) 12.5] + [Gallons of Water (annulus) 13.5])] x [Removal Multiplier 5] = [Total Gallons to be Removed 130]

Actual Gallons Removed: 130

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
1545	0	5.60	.060	10.5	287
1640	130	5.69	.161	12.4	10
1730	130	5.73	.153	11.4	190
Post Sampling 1730	130	5.73	.153	11.4	190

Well	V well	Annulus* dia	V annulus
1.5"	0.10gal/ft	4.0	0.29gal/ft
2"	0.17gal/ft	6.5	0.46gal/ft
		7.25	0.59gal/ft
		7.75	0.69gal/ft
		8.25	0.79gal/ft
4"	0.66gal/ft	8.25	0.64gal/ft
		10.25	1.06gal/ft
		12.25	1.63gal/ft
6"	1.5gal/ft	12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
IIMO027YM	TOTAL METAL	1L	N	NITRIC pH<2	1L HDPE	1730
IIMO027ZM	DISSOLVED METAL	1L	Y	NITRIC pH<2	1L HDPE	1730

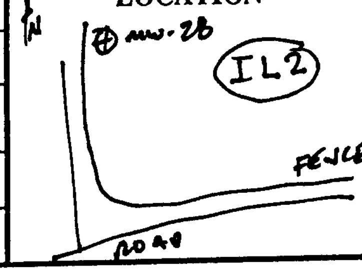
Notes (include data on floaters/sinkers with measuring device, well condition, etc.)
WELL PURGED WITH KECK PUMP WITH SURGE BLOCK BELOW

* Assumes 30% porosity

Signature JP Naughton Date 2-17-93 No. of Bottles 2

Arthur D Little	# Monitoring Well Sampling Data Sheet	Well No. MW-28 Client US AEC Project FT MEADE Case No. 67069

Date Sampled: 2-17-93	Sampled By: FRIEDENSON/NAUGHTON	LOCATION
Depth to Water: 9.06'	Total Depth: 24.47'	
O_2 21.0	LEL 000	PID 0.0
Measuring Point: BLACK MARK TOP OF RISER		
Equipment: 1.5" ID TEFLON BAIL (8" LENGTH)		



WELL VOLUME (* use appropriate values in table for each code letter)

V well		Depth Screen Bottom		Depth Water		Gallons of Water (well)
0.66	x [(	24.5	-	9.1	)] =	10.2

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus		Depth Screen Bottom		Depth Bottom of Seal		Gallons of Water (annulus)
0.64	x [(	24.5	-	7.0	)] =	11.2

WATER TO BE REMOVED

	Gallons of Water (well)		Gallons of Water (annulus)		Removal Multipler		Total Gallons to be Removed	Actual Gallons Removed
[(	10.2	+	11.2	)] x	5	=	107	110

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
1035	0	5.21	.164	10.3	>999
1215	110	5.43	.144	10.4	>999
Post Sampling 1230	110	5.32	.138	11.1	>999

Well		Annulus*	
V well		dia	V annulus
1.5" 0.10gal/ft		4.0	0.29gal/ft
2" 0.17gal/ft		6.5	0.46gal/ft
		7.25	0.59gal/ft
		7.75	0.69gal/ft
		8.25	0.79gal/ft
4" 0.66gal/ft		8.25	0.64gal/ft
		10.25	1.06gal/ft
		12.25	1.63gal/ft
6" 1.5gal/ft		12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
I1MOD28YM	TOTAL METAL	1000	N	NITRIC pH<2	1L HDPE	1215
I1MOD28ZM	DISSOLVED METAL	1000	Y	NITRIC pH<2	1L HDPE	1215

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)

* Assumes 30% porosity

Signature gp Naught Date 2-17-93 No. of Bottles 2

Arthur D Little

Monitoring Well Sampling Data Sheet

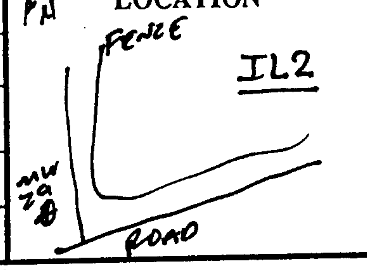
Well No. MW-29 (IL2)
Client USAEC
Project FT MEADE
Case No. 67069

Date Sampled: 2-17-93
Sampled By: FRIEDENSON / NAUGHTON
Depth to Water: 11.06'
Total Depth: 26.70'

O_2 20.8 | LEL 001 | PID 0.2

Measuring Point: BLACK MARK TOP OF RISER
Equipment: 1.5" ID TEFLON BAIL (8' LENGTH)

LOCATION



WELL VOLUME (* use appropriate values in table for each code letter)

V well		Depth Screen Bottom		Depth Water		Gallons of Water (well)
0.66	x [(	26.7	-	11.1	)] =	10.3

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus		Depth Screen Bottom		Depth Bottom of Seal		Gallons of Water (annulus)
0.64	x [(	26.7	-	7.5	)] =	12.3

WATER TO BE REMOVED

	Gallons of Water (well)		Gallons of Water (annulus)		Removal Multiplier		Total Gallons to be Removed	Actual Gallons Removed
[(	10.3	+	12.3	)] x	5	=	113	110

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
1541	0	6.48	.824	10.6	>999
1715	110	6.41	.827	8.1	>999
Post Sampling 1730	110	6.41	.846	8.5	>999

Well V well	Annulus* dia	Annulus* V annulus
1.5" 0.10gal/ft	4.0	0.29gal/ft
2" 0.17gal/ft	6.5	0.46gal/ft
	7.25	0.59gal/ft
	7.75	0.69gal/ft
	8.25	0.79gal/ft
4" 0.66gal/ft	8.25	0.64gal/ft
	10.25	1.06gal/ft
	12.25	1.63gal/ft
6" 1.5gal/ft	12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
I1M00291M	TOTAL METAL	1000	N	NITRIC pH<2	1L HDPE	1715
I1M00292M	DISSOLVED METAL	1000	Y	NITRIC pH<2	1L HDPE	1715

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)
WATER AND WELL HAS STRONG SEWAGE ODOR.

* Assumes 30% porosity

Signature GPNaughton   Date 2-17-93   No. of Bottles 2

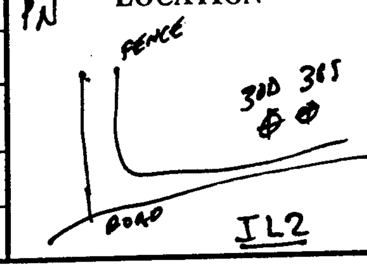
Arthur D Little	**Monitoring Well Sampling Data Sheet**	Well No. MW-30 S (IL2) Client USAEC Project FT MEADE. Case No. 67069

Date Sampled: 2-17-93	Sampled By: FRIEDENSON / NAUGHTON	
Depth to Water: 18.35'	Total Depth: 31.92'	
O_2 —	LEL 000	PID —

Measuring Point: BLACK MARK TOP OF RISER

Equipment: 1.5" ID TEFLON BAIL (8' LENGTH)

LOCATION



WELL VOLUME (* use appropriate values in table for each code letter)

V well		Depth Screen Bottom		Depth Water		Gallons of Water (well)
0.66	x [(	31.9	-	18.4	)] =	8.9

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus		Depth Screen Bottom		Depth Bottom of Seal		Gallons of Water (annulus)
0.64	x [(	31.9	-	8.0	)] =	15.3

WATER TO BE REMOVED

	Gallons of Water (well)		Gallons of Water (annulus)		Removal Multiplier		Total Gallons to be Removed	Actual Gallons Removed
[(	8.9	+	15.3	)] x	5	=	121	45

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
1325/2-16-93	0	6.59	.508	12.1	>999
0815	15	5.96	.286	10.5	>999
1245	45	6.20	.233	11.8	>999
Post Sampling 1300	45	6.23	.238	11.9	>999

Well	V well	Annulus* dia	V annulus
1.5"	0.10gal/ft	4.0	0.29gal/ft
2"	0.17gal/ft	6.5	0.46gal/ft
		7.25	0.59gal/ft
		7.75	0.69gal/ft
		8.25	0.79gal/ft
4"	0.66gal/ft	8.25	0.64gal/ft
		10.25	1.06gal/ft
		12.25	1.63gal/ft
6"	1.5gal/ft	12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
I1M030SYM	TOTAL METAL	1000	N	NITRIC pH<2	1L HDPE	1245
I1M030SZM	DISSOLVED METAL	1000	Y	NITRIC pH<2	1L HDPE	1245

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)

15 GALLONS REMOVED ON 2-16-93 UNTIL DRY

30 GALLONS REMOVED ON 2-17-93 UNTIL DRY

PID FAULT INDICATING

* Assumes 30% porosity

Signature GP Naughton Date 2-17-93 No. of Bottles 2

Arthur D Little	**Monitoring Well Sampling Data Sheet**	Well No. MW-30D (IL2) Client USAEC Project FT MEADE. Case No. 67069

Date Sampled: 2-17-93 | Sampled By: ELLINGWOOD/NAUGHTON

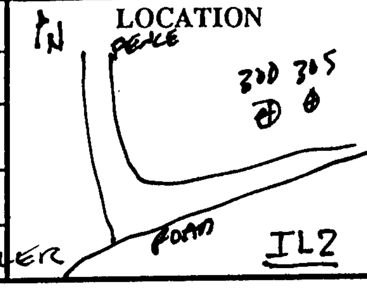
Depth to Water: 29.99' | Total Depth: 131.99'

O_2 — | LEL 000 | PID —

Measuring Point: BLACK MARK TOP OF RISER

Equipment: KECK SUBMIRSIBLE PUMP, SAMPLED WITH TEFLON BAILER

LOCATION



WELL VOLUME (* use appropriate values in table for each code letter)

V well [0.66] x [([132.0] - [30.0])] = [67.3]

(V well × [(Depth Screen Bottom − Depth Water)] = Gallons of Water (well))

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus [0.64] x [([132.0] - [113.0])] = [18.6]

(V annulus × [(Depth Screen Bottom − Depth Bottom of Seal)] = Gallons of Water (annulus))

WATER TO BE REMOVED

[([67.3] + [18.6])] x [5] = [429.5]

(Gallons of Water (well) + Gallons of Water (annulus)) × Removal Multipler = Total Gallons to be Removed

Actual Gallons Removed: 430

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
1325/2-17-93	0	10.29	.303	11.9	>999
1440	430	5.89	.107	13.3	799
Post Sampling 1445	430	11.16	.493	12.7	760

Well		Annulus*	
V well		dia	V annulus
1.5"	0.10gal/ft	4.0	0.29gal/ft
2"	0.17gal/ft	6.5	0.46gal/ft
		7.25	0.59gal/ft
		7.75	0.69gal/ft
		8.25	0.79gal/ft
4"	0.66gal/ft	8.25	0.64gal/ft
		10.25	1.06gal/ft
		12.25	1.63gal/ft
6"	1.5gal/ft	12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
I1MD30DYM	TOTAL METAL	1000	N	NITRIC pH<2	1L HDPE	1440
I1MD30DZM	DISSOLVED METAL	1000	Y	NITRIC pH<2	1L HDPE	1440
DUPLICATE	TOTAL METAL	1000	N	NITRIC pH<2	1L HDPE	1440
DUPLICATE	DISSOLVED METAL	1000	Y	NITRIC pH<2	1L HDPE	1440
Q1D04S1YM						
Q1D04S1ZM						

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)

80 GALLONS REMOVED ON 2-16-93
350 GALLONS REMOVED ON 2-17-93

PID FAULT INDICATION

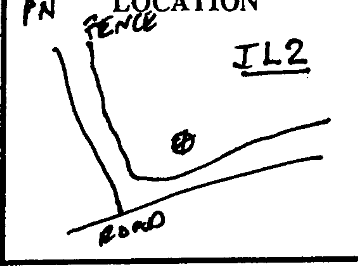
* Assumes 30% porosity

Signature [signature] Date 2-17-93 No. of Bottles 4

Arthur D Little	**Monitoring Well Sampling Data Sheet**	Well No. MW-31 (IL2)
		Client US AEC
		Project FT MEADE
		Case No. 67069

Date Sampled: 2-17-93	Sampled By: FRIEDENSON/NAUGHTON	
Depth to Water: 12.71'	Total Depth: 29.76'	
O_2	LEL	PID
Measuring Point: BLACK MARK TOP OF RISER		
Equipment: 1.5" ID TEFLON BAIL (8' LENGTH)		

LOCATION



WELL VOLUME (* use appropriate values in table for each code letter)

V well		Depth Screen Bottom		Depth Water		Gallons of Water (well)
0.66	x [(	29.8	-	12.7	)] =	11.3

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus		Depth Screen Bottom		Depth Bottom of Seal		Gallons of Water (annulus)
0.64	x [(	29.8	-	5.0	)] =	15.9

WATER TO BE REMOVED

	Gallons of Water (well)		Gallons of Water (annulus)		Removal Multiplier		Total Gallons to be Removed	Actual Gallons Removed
[(	11.3	+	15.9	)] x	5	=	136	140

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
1420 / 2-16-93	0	6.38	1101	11.0	>999
0845	100	6.34	1099	10.6	>999
0940	140	6.62	1099	11.2	>999
Post Sampling 0945	140	6.56	1097	11.3	>999

Well		Annulus*	
	V well	dia	V annulus
1.5"	0.10gal/ft	4.0	0.29gal/ft
2"	0.17gal/ft	6.5	0.46gal/ft
		7.25	0.59gal/ft
		7.75	0.69gal/ft
		8.25	0.79gal/ft
4"	0.66gal/ft	8.25	0.64gal/ft
		10.25	1.06gal/ft
		12.25	1.63gal/ft
6"	1.5gal/ft	12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
IIM0031YM	TOTAL METALS	1000	N	NITRIC pH <2	1L HDPE	0945
IIM0031ZM	DISSOLVED METALS	1000	Y	NITRIC pH <2	1L HDPE	0945
FIELD BLANK	TOTAL METALS	1000	N	NITRIC pH <2	1L HDPE	0830
RINSE BLANK	TOTAL METALS	1000	N	NITRIC pH <2	1L HDPE	0840
93QC-250	(QID0250YM)					
93QC-150	(QID0150YM)					

Notes (include data on floaters/sinkers with measuring device, well condition, etc.) LEL/O2 BATTERY OUT PID FAULT INDICATION
100 GALLONS REMOVED ON 2-16-93
40 GALLONS REMOVED ON 2-17-93
FIELD BLANK AND RINSE BLANK COLLECTED PRIOR TO PURGING 2-17-93

* Assumes 30% porosity

Signature [signature] Date 2-17-93 No. of Bottles 4

Appendix E: Ordnance Demolition Area Field Forms

Appendix E-1: Ordnance Demolition Area Soil Boring Logs and Monitoring Well Installation Logs

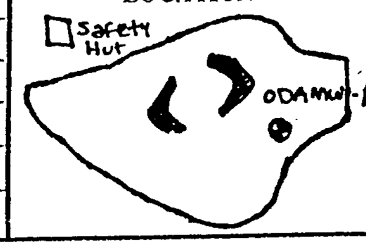
Arthur D Little

Soil Boring Log

Boring No. ODAMW-1
Client USAEC
Project Fort Meade
Case No. 67069

Date Start 1/22/93	Contractor ATEC		
Date Complete 1/25/93	Drill Method Hollow Stem Auger		
Hole Diameter 1.1'	Type Of Rig MOBILE DRILL B-57		
Casing Size 6" H.S. AUGER	Drilling Additives NONE		
Boring Depth 15.0'	Geologist M. Greenwood G. Naughton		
Sampling Method 2' x 3" SPLIT SPOON			

LOCATION



Scale in Feet	SAMPLE Type and number	Interval	Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
0.0 – 2.0	Chem. Sample AE31850 AM geo SS01	0.0-2.0	1.7	7 10 16 18	0.0	[SW] 0-0.3 Moderate yellowish brown 10YR 5/4, well sorted sand, trace cobbles, trace organics, moist [SP] 0.3-1.7' Mottled, primarily dark yellowish orange 10YR 6/6 with bands of light brown 5YR 5/6 Poorly sorted fine-medium sand, trace sub-angular pebbles, dry, medium dense
2.0 – 5.0						
5.0 – 7.0	chemical sample BE31415 BM geo SS02	5.0-7.0	1.4	4 8 12 14	0.0	[SP] 0-0.4 Dark yellowish orange 10YR 6/6, Poorly sorted fine-medium sand, trace gravel wet [SW] 0.4-0.55 light brown 5Yr 5/6, well sorted fine sand, moist [SM] 0.55-1.4 very pale orange 10YR 8/2, sandy silt with well sorted fine sand, slightly moist, Medium dense
7.0 – 10.0						
10.0 – 12.0	Chemical Sample CE30900 CM geo SS03	10.0-12.0	1'	3 8 10 10	0.1	[SW] Mottled light brown 5YR 5/6 and Dark yellowish orange 10YR 6/6, well sorted fine sand, trace OIH, moist, Loose
12.0 – 13.0						

▽ 3' 5' 5'

140 lb HAMMER
30" HAMMER FALL
3" SPLIT SPOON

Arthur D Little

Soil Boring Log
Continuation Page

Boring No. ODA MW-1
Client USAEC
Project FT. MEADE
Case No. 67069

Scale in Feet	SAMPLE Type and number	Interval	Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
13.0						
14.0						
15.0						END OF BORING

Arthur D Little

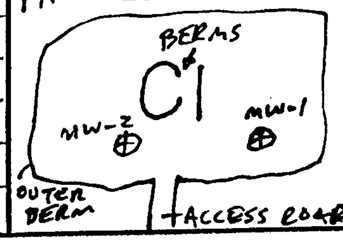
Soil Boring Log

Boring No. ODA MW-2
Client USAEC
Project FT. MEADE
Case No. 69069

Date Start 1/25/93
Date Complete 1/25/93
Hole Diameter 1.1'
Casing Size 6" H.S. AUGER
Boring Depth 15.0'

Contractor ATEC
Drill Method HOLLOW STEM AUGER
Type Of Rig MOBILE DRILL B-57
Drilling Additives
Geologist G. NAUGHTON

LOCATION



Sampling Method 3" x 2' SPLIT SPOON, 140 lb HAMMER, 30" DROP

Scale in Feet	SAMPLE Type and number	SAMPLE Interval	SAMPLE Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
0.0 – 2.0	CHEM-AE AM GEO-SS01	0.0-2.0	1.8'	12 14 19 16	0.0	LIGHT BROWN 5YR 5/6 SILTY SAND WITH SOME GRAVEL 0.0-1.0. 0.0-1.0 POORLY SORTED MEDIUM DENSE. 1.0-2.0 BECOMING FINER WELL SORTED LOOSE SAND, SUB-ROUNDED. [SP]
3.0						
4.0						
5.0 – 7.0	CHEM-BE BM GEO SS02	5.0-7.0	1.5	7 12 13 14	0.0	LIGHT BROWN 5YR 5/6 MEDIUM AND FINE SAND, LOOSE, POORLY SORTED LITTLE OR NO SILT, MOIST [SP]
8.0						
9.0						
10.0 – 12.0	CHEM CE CM GEO SS03	10.0-12.0	1.0	4 11 15 19	0.0	LIGHT BROWN 5YR 5/6 MEDIUM AND FINE SAND, LOOSE, POORLY SORTED, WET 0.8-1.0 LIGHT GREY N7 SILT AND CLAY WITH MODERATE PLASTICITY [SP]
13.0						

Arthur D Little

Soil Boring Log
Continuation Page

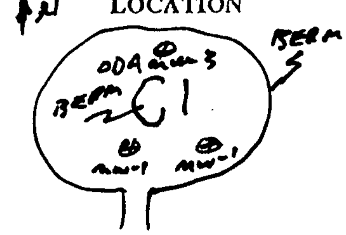
Boring No. ODA MW-2
Client USAEC
Project FT. MEADE
Case No. 64069

Scale in Feet	SAMPLE Type and number	Interval	Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
13.0						
14.0						
15.0						END OF BORING

Arthur D Little	**Soil Boring Log**	Boring No. ODA MW-3 Client USAEC Project FT MEADE Case No. 67069

Date Start 1/26/93	Contractor ATEC	LOCATION
Date Complete 1/26/93	Drill Method HOLLOW STEM AUGER	
Hole Diameter 1.1'	Type Of Rig MOBILE DRILL B-57	
Casing Size 6" H.S. AUGER	Drilling Additives NONE	
Boring Depth 16.0'	Geologist G. NAUGHTON	

Sampling Method 3" x 2' SPLIT SPOON, 140 lb HAMMER, 30" DROP



Scale in Feet	SAMPLE: Type and number	SAMPLE: Interval	SAMPLE: Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
0.0 – 2.0	CHEM AE AM GEO SS01	0.0-2.0	1.8'	9 18 23 16	0.0	0.0-0.2 [SM] GRAYISH BROWN 5YR 3/2 MEDIUM SAND WITH SILT, ROOTS, LOOSE, POORLY SORTED 0.2-1.0 [SM] DARK YELLOWISH ORANGE 10YR 6/6 SILT WITH POORLY SORTED MEDIUM SAND, STIFF 1.0-1.8 [SP] LIGHT BROWN 5YR 5/6 MEDIUM AND FINE SAND, LOOSE, POORLY SORTED
2.0 – 5.0						
5.0 – 7.0	CHEM BE BM GEO SS02	5.0-7.0	1.8'	1 12 14 14	0.2	[SP] LIGHT BROWN MEDIUM AND FINE SAND WITH SOME GRAVELS, ROUNDED, LOOSE, POORLY SORTED, MOIST.
7.0 – 10.0						
10.0 – 12.0	CHEM CE CM GEO SS03	10.0-12.0	1.5'	4 10 13 11	0.6	[SP] SAME AS ABOVE, WET
12.0 – 13.0						

Arthur D Little

Soil Boring Log
Continuation Page

Boring No. ODA MW-3
Client USAEC
Project FT MEADE
Case No. 67069

Scale in Feet	SAMPLE Type and number	SAMPLE Interval	SAMPLE Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
13.0						
14.0 – 15.0	GEO 5504	14.0-16.0	1.4'	7 12 10 12	0.7	[SP] SAME AS ABOVE
16.0						END OF BORING

Arthur D Little

Monitoring Well Design

Boring No. OD4 MW-1
Client USAEC
Project FT. MEADE
Case No. 67069

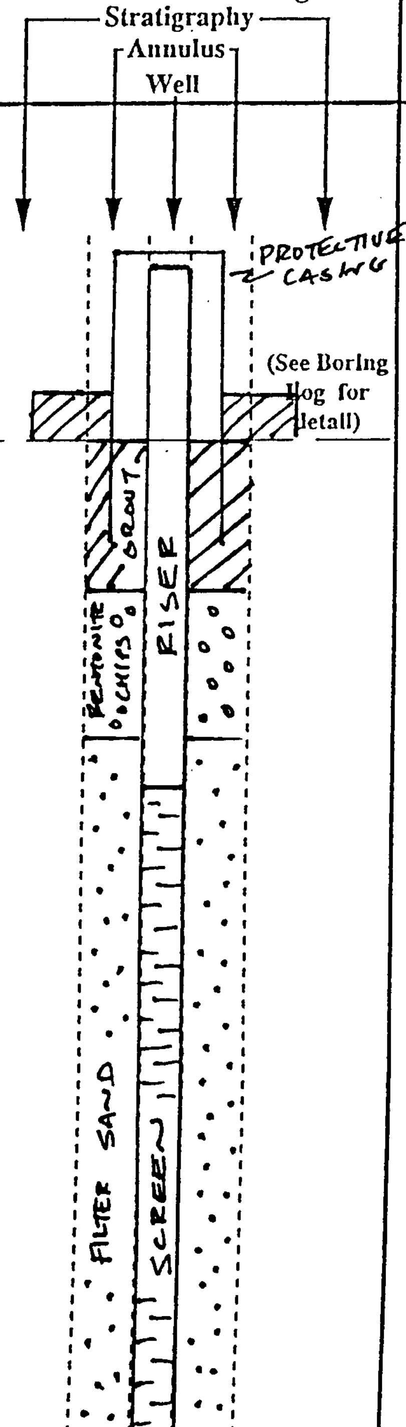
Date Start 1/25/93	Date Complete 1/25/93	Hole Diameter 1.1'	Casing Size 6" HS AUGER

Contractor A-TEC	Geologist G. NAUGHTON
Drill Method 6" HOLLOW STEM AUGER	Boring Depth 15.0'
Type Of Rig MOBILE DRILL B-57	Grout method SHOVELLED
Datum	Development Method TO BE DEVELOPED

Notes

Scale in Feet	SAMPLE Type and number	Total Organics (ppm)
0.0		
1.0	SS01 CHEM GEO	0.0
2.0		
3.0		
4.0		
5.0		
6.0	SS02 CHEM GEO	0.0
7.0		
8.0		
9.0		
10		

Well Construction Diagram



Construction Specifications

Elevation Top Of Casing ______
Elevation Top Of Riser Pipe ______
Elevation Ground Surface ______

(surveyed elevations)
(depth from ground surface)

Type of Surface Casing 6" STEEL
I.D. Surface Casing 6"

Type Of Riser Pipe PVC (SCH. 40)
I.D. Riser Pipe 4"

Diameter Of Borehole 1.1'

Type Of Backfill GROUT

Type Of Seal BENTONITE CHIPS
Depth To Top Of Seal 1.5'

Type Of Sand Pack ______
Depth To Top Of Sand Pack 3.0'

Type Of Screen MACHINE SLOTTED PVC
Slot Size 0.01'
I.D. Screen 4"
Screened Interval 10.0'

Depth To Bottom Of Well 13.5'

Depth To Bottom Of Borehole 15.0'

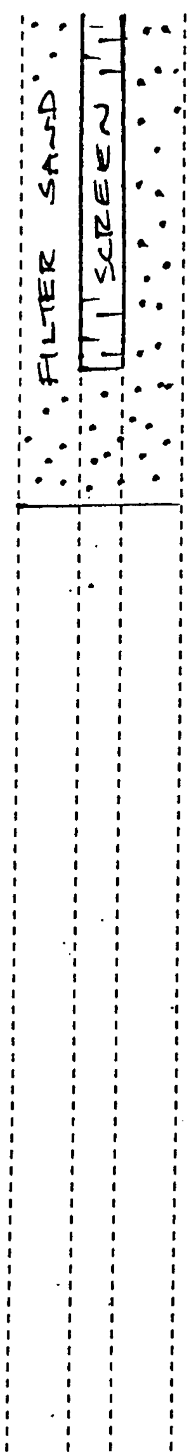
Artlur D Little

Monitoring Well Design
(Continuation Page)

Boring No. ODA MW-1
Client US AEC
Project FT. MEADE
Case No. 67069

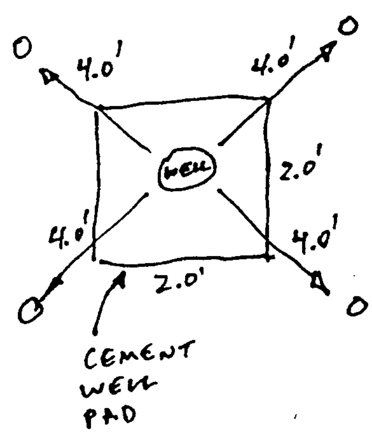
Scale in Feet	SAMPLE Type and number	SAMPLE Total Organics (ppm)
-10.6		
-11.0	SS03	0.1
-12.0		
-13.0		
-14.0		
-15.0		

Well Construction Diagram
Stratigraphy
Annulus
Well



Notes and Comments

PICKET CONFIGURATION



GROUT MIXTURE
3 BAGS PORTLAND CEMENT TYPE II
15 lbs GRANULAR BENTONITE
20 GALLONS WATER
MECHANICALLY MIXED

BENTONITE CHIPS
CETCO - COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
PURE GOLD MEDIUM CHIPS

GRANULAR BENTONITE
CETCO - C/S GRANULAR

Arthur D Little

Monitoring Well Design

Boring No.	ODA MW-2
Client	USAEC
Project	FT. MEADE
Case No.	67069

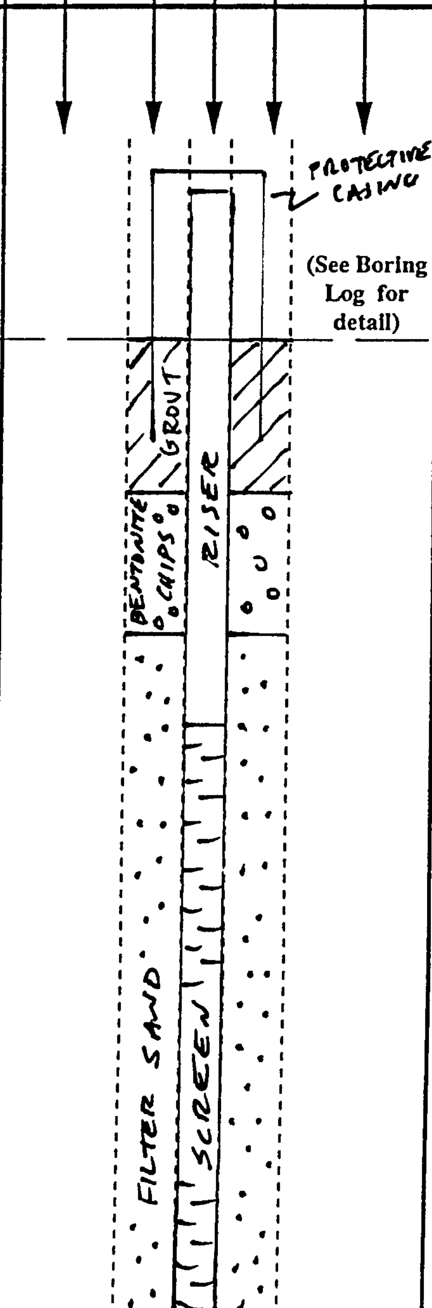
Date Start	1/25/93	Date Complete	1/25/93	Hole Diameter	1.1'	Casing Size	6" HS. AUGER

Contractor	A TEL	Geologist	G. NAUGHTON
Drill Method	HOLLOW STEM AUGER	Boring Depth	15.0'
Type Of Rig	MOBILE DRILL B-57	Grout method	POURED
Datum		Development Method	TO BE DEVELOPED

Notes

Scale in Feet	SAMPLE Type and number	SAMPLE Total Organics (ppm)
0.0		
1.0	SS01 CHEM GEO	0.0
2.0		
3.0		
4.0		
5.0		
6.0	SS02 CHEM GEO	0.0
7.0		
8.0		
9.0		
10.0		

Well Construction Diagram



Construction Specifications

Elevation Top Of Casing ______

Elevation Top Of Riser Pipe ______

Elevation Ground Surface ______

(surveyed elevations)

(depth from ground surface)

Type of Surface Casing STEEL PIPE, HINGED TOP

I.D. Surface Casing 6"

Type Of Riser Pipe PVC (SCH 40)

I.D. Riser Pipe 4"

Diameter Of Borehole 1.1'

Type Of Backfill GROUT

Type Of Seal BENTONITE CHIPS

Depth To Top Of Seal 1.5'

Type Of Sand Pack ______

Depth To Top Of Sand Pack 3.0'

Type Of Screen MACHINE SLOTED PVC

Slot Size 0.01'

I.D. Screen 4"

Screened Interval 14.0 - 4.0'

Depth To Bottom Of Well 14.0'

Depth To Bottom Of Borehole 15.0'

Arthur D Little

Monitoring Well Design
(Continuation Page)

Boring No.	ODA MW-2
Client	USAEC
Project	FT. MEADE
Case No.	67069

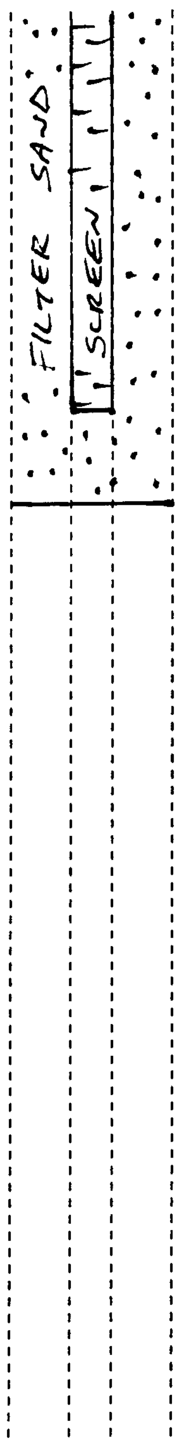
Scale in Feet	SAMPLE Type and number	Total Organics (ppm)
10.0		
	SS03 CHEM GEO	0.0
11.0		
12.0		
13.0		
14.0		
15.0		

Well Construction Diagram

Stratigraphy

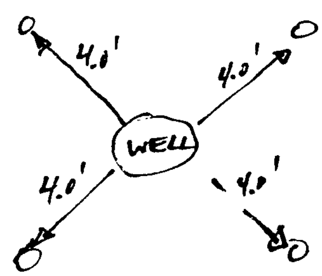
Annulus

Well



Notes and Comments

PICKET CONFIGURATION



GROUT
1.5 BAGS PORTLAND CEMENT TYPE II
7.5 lbs GRANULAR BENTONITE
7.5 GALLONS WATER
MECHANICALLY MIXED

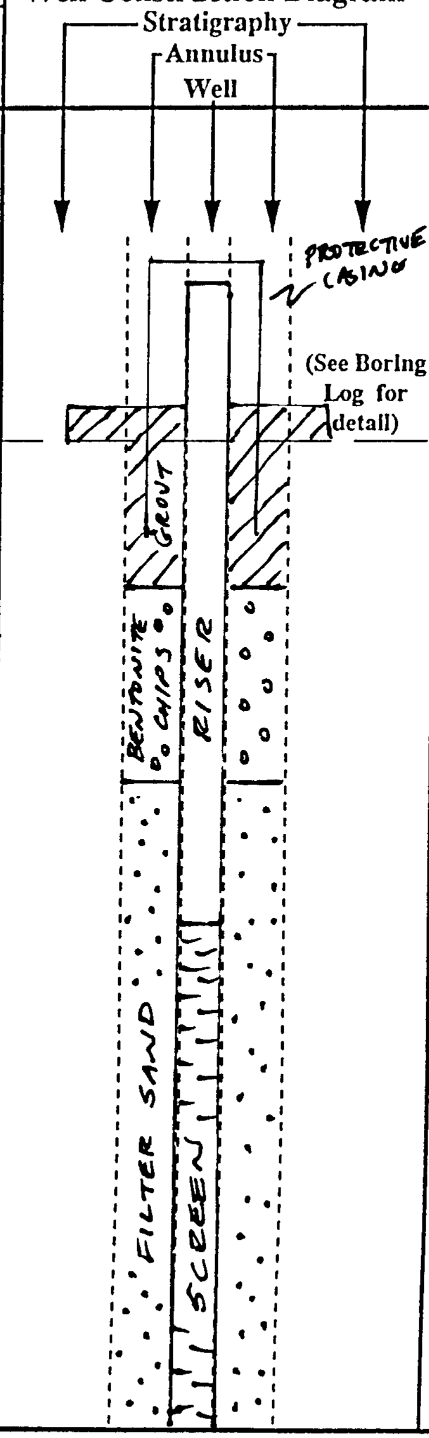
BENTONITE CHIPS
CETCO (COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY)
PURE GOLD MEDIUM CHIPS
GRANULAR BENTONITE
CETCO - C/S GRANULAR

Arthur D Little	Monitoring Well Design	Boring No. ODA MW-3 Client USAEC Project FT MEADE Case No. 69069

Date Start 1/26/93	Date Complete 1/26/93	Hole Diameter 1.1'	Casing Size 6" H.S. AUGER
Contractor ATEC		Geologist G. NAUGHTON	
Drill Method HOLLOW STEM AUGER		Boring Depth 16.0'	
Type Of Rig MOBILE DRILL B-57		Grout method POURED	
Datum		Development Method TO BE DEVELOPED	
Notes			

Scale in Feet	SAMPLE Type and number	SAMPLE Total Organics (ppm)
0.0		
1.0	GEO SS01	0.0
2.0		
3.0		
4.0		
5.0		
6.0	GEO SS02	0.2
7.0		
8.0		
9.0		
10.0		

Well Construction Diagram



Construction Specifications

Elevation Top Of Casing ________

Elevation Top Of Riser Pipe ________

Elevation Ground Surface ________

(surveyed elevations)
(depth from ground surface)

Type of Surface Casing HINGED TOP STEEL PIPE
I.D. Surface Casing 6"

Type Of Riser Pipe PVC (SCH 40)
I.D. Riser Pipe 4"

Diameter Of Borehole 1.1'

Type Of Backfill GROUT

Type Of Seal BENTONITE CHIPS
Depth To Top Of Seal 1.5'

Type Of Sand Pack ________
Depth To Top Of Sand Pack 3.5'

Type Of Screen MACHINE SLOTTED PVC
Slot Size 0.01'
I.D. Screen 4"
Screened Interval 15.0' - 5.0'

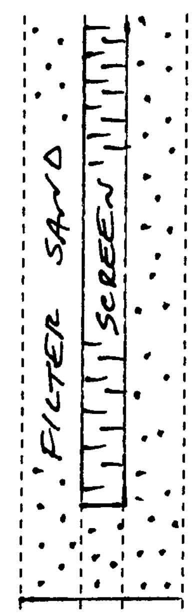
Depth To Bottom Of Well 15.0'

Depth To Bottom Of Borehole 16.0'

Arthur D Little	Monitoring Well Design (Continuation Page)	Boring No. ODA MW-3 Client USAEC Project FT. MEADE Case No. 67069

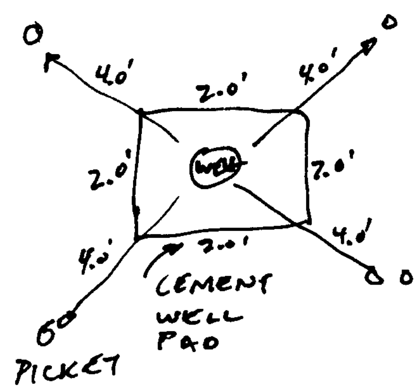
Scale in Feet	SAMPLE Type and number	SAMPLE Total Organics (ppm)
10.0		
11.0	GEO SS03	0.6
12.0		
13.0		
14.0		
15.0	GEO SS04	0.7
16.0		

Well Construction Diagram (Stratigraphy, Annulus, Well)



Notes and Comments

PICKET CONFIGURATION



GROUT MIXTURE

2 BAGS PORTLAND CEMENT TYPE II

10 lbs GRANULAR BENTONITE

15 GALLONS WATER

MECHANICALLY MIXED

BENTONITE CHIPS

CETCO - COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY

PURE GOLD MEDIUM CHIPS

GRANULAR BENTONITE

CETCO - C/S GRANULAR

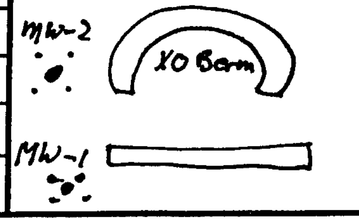
Appendix E-2: Ordnance Demolition Area Monitoring Well Development Logs

ODAMW-1 DJV

Arthur D Little	**Monitoring Well Development Data Sheet**	Well No ODAMW-1 Client USAEC Project FT MEADE Case No. 67069

Date Developed: 2/15/93	Developed By:
Depth to Water: 5.22	Total Depth: 16.27
0^2 20.8 LEL 0 HNu 1.8	
Measuring Point: double notch on PVC Riser	
Notes:	

LOCATION



WELL VOLUME (* use appropriate values in table for each code letter)

V well		Depth Screen Bottom		Depth Water		Gallons of Water (well)
0.66 ~~.0664"~~ EF	x [(	16.27	-	5.22	)] =	7.293

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annalus		Depth Screen Bottom		Depth Bottom of Seal		Gallons of Water (annalus)
1.06	x [(	16.27	-	5.75	)] =	11.15

WATER TO BE REMOVED

	Gallons of Water (well)		Gallons of Water (annulus)		Removal Multiplier		Total Gallons to be Removed	Actual Gallons Removed
[(	7.293	+	11.15	)] x	5	=	92.22	120

MEASUREMENTS

Time	Number of Gallons Removed 0.0 gallons	pH	Conductivity	Temperature	Turbidity
1405		4.87	.080	7.0	999
1445	~~30~~ 32	4.97	.095	7.9	999
1525	60	4.91	.105	8.3	999
1550	90	5.16	.108	8.1	999

TABLE

Well V well	Annalus * dia	V annalus
2" 0.17gal/ft	6.5	0.46gal/ft
	7.25	0.59gal/ft
	7.75	0.69gal/ft
	8.25	0.79gal/ft
4" 0.66gal/ft	8.25	0.64gal/ft
	10.25	1.06gal/ft
	12.25	1.63gal/ft
6" 1.5gal/ft	12.25	1.41gal/ft

Depth to Sediment: Before — After —

Type/Capacity of pump: Hand baler / KECK Pump

Pumping Rate — Recharge Time

Time to Develop Well: Start 1405 Finish 1605 Duration 120 minutes

COMMENTS (include description of water removed)

1st 90 gallons hand baled.
1550 switch to KECK pump. Pumped 30 gallons till clear
Recharge at .1'/7 seconds.

15 MINUTES RECOVERY TO 6.03'

* Assumes 30% porosity for sand pack

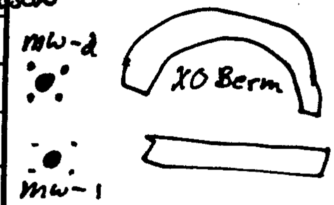
Arthur D Little

Monitoring Well Development Data Sheet

Well No.	ODAMW-~~#7~~ 2
Client	USAEC
Project	FT MEADE
Case No.	67069

Date Developed: 2/15/93		Developed By: K. Elingwood/Friedenson	
Depth to Water: 6.95		Total Depth: 16.74	
0^2 20.7	LEL 0	HNu 1.3	
Measuring Point: V notch on PVC RISER			
Notes:			

LOCATION



WELL VOLUME (* use appropriate values in table for each code letter)

V well		Depth Screen Bottom		Depth Water		Gallons of Water (well)
0.66 4"	x [(	16.74	-	6.95	)] =	6.46

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annalus		Depth Screen Bottom		Depth Bottom of Seal		Gallons of Water (annalus)
1.06	x [(	16.74	-	5.74	)] =	11.66

WATER TO BE REMOVED

	Gallons of Water (well)		Gallons of Water (annulus)		Removal Multiplier		Total Gallons to be Removed	Actual Gallons Removed
[(	6.46	+	11.66	)] x	5	=	90.6	90

MEASUREMENTS

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
1335	0.0 gallons	~~4.69~~ 4.77	.119	9.3	999
1416	30	4.61	~~.080~~ .090	9.5	~~999~~ 190
1445	60	4.82	.091	10.0	14
1500	90	4.71	.091 ~~.105~~ EF	9.7	863*

TABLE

Well V well	Annalus * dia	V annalus
2" 0.17gal/ft	6.5	0.46gal/ft
	7.25	0.59gal/ft
	7.75	0.69gal/ft
	8.25	0.79gal/ft
4" 0.66gal/ft	8.25	0.64gal/ft
	10.25	1.06gal/ft
	12.25	1.63gal/ft
6" 1.5gal/ft	12.25	1.41gal/ft

Depth to Sediment: Before —— After ——

Type/Capacity of pump KECK/GRUNDFOS

Pumping Rate ~60 GALLONS/HOUR | Recharge Time 10 MINUTES TO 6.95'

Time to Develop Well: Start 1335 Finish 1500 Duration 1:25

COMMENTS (include description of water removed)

* INCREASED PUMPING RATE TO TESTWELL RECHARGE = 125 HHz to 200 HHz.

/

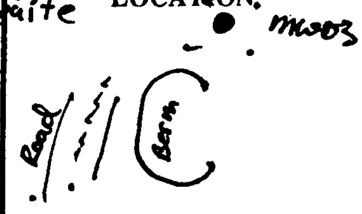
* Assumes 30% porosity for sand pack

ODA

Arthur D Little	**Monitoring Well Development Data Sheet**	Well No. MW03 Client USAEC Project Ft. Meade Case No. 67069

Date Developed: 2/12/93	Developed By: E. Friedenson T. Goldthwaite	
Depth to Water: 6.26'	Total Depth: ~~17.47'~~ 17.77' (T.G.)	
0^2 20.7%	LEL ~~+40~~ 0.3% (T.G.)	HNu 1.4 PPM
Measuring Point: Double Notch PVC riser		
Notes:		

LOCATION



WELL VOLUME (* use appropriate values in table for each code letter)

V well (TSG)		Depth Screen Bottom		Depth Water		Gallons of Water (well)
~~.41~~ .66	x [(	17.77	-	6.26	)] =	7.6

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annalus		Depth Screen Bottom (TSG)		Depth Bottom of Seal		Gallons of Water (annalus)
1.06	x [(	17.77'	-	~~3.5'~~ 7.37	)] =	11.02

WATER TO BE REMOVED

	Gallons of Water (well)		Gallons of Water (annulus)		Removal Multiplier		Total Gallons to be Removed	Actual Gallons Removed (T.G.)
[(	7.6	+	11.02	)] x	5	=	93	~~95~~ 115

MEASUREMENTS

Time	Number of Gallons Removed 0.0 gallons	pH	Conductivity	Temperature	Turbidity
1000		5.31	.120	4.6	7999
1019	15	5.30	0.07	5.3	7999
1032	30	5.2	0.06	8.7	7999
1047	45	5.2	0.06	6.3	7999
1102	60	5.3	0.05	9.6	7999
1115	75	5.2	0.05	9.4	7999
1127	95	5.3	.05	9.7	7999

TABLE

Well		Annalus *	
V well		dia	V annalus
2" 0.17gal/ft		6.5	0.46gal/ft
		7.25	0.59gal/ft
		7.75	0.69gal/ft
		8.25	0.79gal/ft
4" 0.66gal/ft		8.25	0.64gal/ft
		10.25	1.06gal/ft
		12.25	1.63gal/ft
6" 1.5gal/ft		12.25	1.41gal/ft

Depth to Sediment: Before — After —

Type/Capacity of pump Keck SP-87 submersible

Pumping Rate ~1.25 gal/Min | Recharge Time Good

Time to Develop Well: Start 1000 Finish 1150 Duration 110 min.

COMMENTS (include description of water removed)

	Recharge	(T.G.)		
1155 pump off	1202 13.6'	1206 12.6'	~~1210~~	12.22 ~~7.80~~ 7.38' (T.G.)

- purge water light orange/brown in color
- No noticeable sheen/odor of purge water
- Tim & Eric alternated temperature readings. Eric was taking temp reading much sooner ~~following~~ than Tim. Water did not stabilize. * removed extra 20 gallons for water clarity

* Assumes 30% porosity for sand pack

17.6 − 3.6

.4↑ screen.

Appendix E-3: Ordnance Demolition Area Monitoring Well Sampling Logs

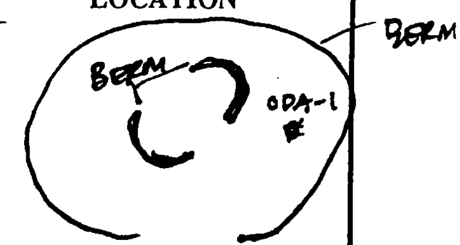
Arthur D Little

Monitoring Well Sampling Data Sheet

Well No. ODA-MW-1
Client USAEC
Project FGGM
Case No. 67069

Date Sampled: 2/26/93
Sampled By: VESPER / WEBBER
Depth to Water: 5.96
Total Depth: 16.17
O_2 20.9 | LEL 0.00 | PID 0.00
Measuring Point: NOTCH AT TOP of PVC RISER
Equipment: TEFLON BAILER

LOCATION



WELL VOLUME (* use appropriate values in table for each code letter)

V well		Depth Screen Bottom		Depth Water		Gallons of Water (well)
0.66	x [(	16.17	-	5.96	)] =	6.74

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus		Depth Screen Bottom		Depth Bottom of Seal		Gallons of Water (annulus)
1.06	x [(	16.17	-	5.5	)] =	11.31

WATER TO BE REMOVED

	Gallons of Water (well)		Gallons of Water (annulus)		Removal Multiplier		Total Gallons to be Removed	Actual Gallons Removed
[(	6.74	+	11.31	)] x	5	=	90.3	100

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
1030	0	5.06	0.060	5.3	10
1250	100	4.69	0.112	7.3	365
Post Sampling 1305	100	4.86	0.121	6.5	274

Well V well	Annulus* dia	V annulus
1.5" 0.10gal/ft	4.0	0.29gal/ft
2" 0.17gal/ft	6.5	0.46gal/ft
	7.25	0.59gal/ft
	7.75	0.69gal/ft
	8.25	0.79gal/ft
4" 0.66gal/ft	8.25	0.64gal/ft
	10.25	1.06gal/ft
	12.25	1.63gal/ft
6" 1.5gal/ft	12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
01M00D1YV	VOA	40	N	HCl	amber vial	12:50
01M00D1YV	VOA	40	N	HCl	amber vial	↓
01M00D1YS	SVOA	1000	N	Ice	amber jar	
01M00D1ZM	FILTER M.	500	Y	HNO3	HDPE	
01M00D1YM	METALS	500	N	HNO3	HDPE	
01M00D1YE	EXPLOSIVES	1000	N	Ice	amber jar	↓

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)

* Assumes 30% porosity

Signature Hannah M. Webber Date 2/26/93 No. of Bottles 6

Arthur D Little	**Monitoring Well Sampling Data Sheet**	Well No. ODA-MW-2 Client USAEC Project FT MEADE Case No. 67069

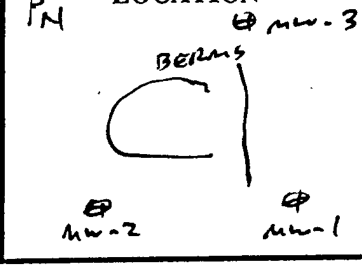
Date Sampled: 2/24/93	Sampled By: WEBBER/GOLDTHWAITE
Depth to Water: 6.6'	Total Depth: 16.7'

O_2 20.7 | LEL 000 | PID 0.4

Measuring Point: NOTCH IN TOP OF PVC RISER

Equipment: KECK PUMP, TEFLON BAILER

LOCATION



WELL VOLUME (* use appropriate values in table for each code letter)

V well [0.66] x [(Depth Screen Bottom [16.7] - Depth Water [6.6])] = Gallons of Water (well) [6.7]

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus [1.06] x [(Depth Screen Bottom [16.7] - Depth Bottom of Seal [5.0])] = Gallons of Water (annulus) [12.4]

WATER TO BE REMOVED

[(Gallons of Water (well) [6.7] + Gallons of Water (annulus) [12.4])] x Removal Multiplier [5] = Total Gallons to be Removed [95.5]

Actual Gallons Removed [100]

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
1545	0	4.75	.115	6.3	211
1630	100	4.19	.108	7.2	0
Post Sampling 1650	100	4.56	.116	6.5	7999

Well V well	Annulus* dia	V annulus
1.5" 0.10gal/ft	4.0	0.29gal/ft
2" 0.17gal/ft	6.5	0.46gal/ft
	7.25	0.59gal/ft
	7.75	0.69gal/ft
	8.25	0.79gal/ft
4" 0.66gal/ft	8.25	0.64gal/ft
	10.25	1.06gal/ft
	12.25	1.63gal/ft
6" 1.5gal/ft	12.25	1.41gal/ft

SAMPLING

Sample ID	Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
01M0002YV	VOA	2 X 40	N	HCl pH<2	AMBER	1645
01M0002YS	BNA	1000	N	ICE	AMBER	1645
01M0002YM	METAL	500	N	HNO_3 pH<2	HDPE	1645
01M0002ZM	METAL	500	Y	HNO_3 pH<2	HDPE	1645
01M0002YE	EXPLOSIVE	1000	N	ICE	AMBER	1645

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)

* Assumes 30% porosity

Signature [signature] Date 2/24/93 No. of Bottles 6

Arthur D Little	**Monitoring Well Sampling Data Sheet**	Well No. ODA-MW-3 Client USACE Project F66M Case No. 67069

Date Sampled: 2/22/93 | Sampled By: VESPER/WEBBER

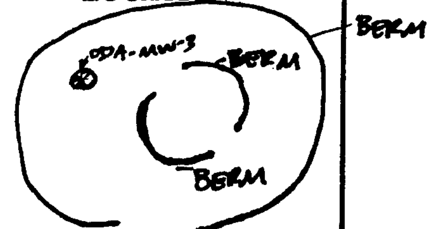
Depth to Water: 5.92 | Total Depth: 17.75

O_2 20.7 | LEL 0.00 | PID 0.0

Measuring Point: TOP OF PVC RISER AT LOCK LATCH ON CASING

Equipment: KECK PUMP + TEFLON BAILER

LOCATION



WELL VOLUME (* use appropriate values in table for each code letter)

V well		Depth Screen Bottom		Depth Water		Gallons of Water (well)
0.66	x [(	17.75	-	5.92	)] =	7.81

ANNULAR VOLUME (ASSUME 30% POROSITY)

V annulus		Depth Screen Bottom		Depth Bottom of Seal		Gallons of Water (annulus)
1.06	x [(	17.75	-	6.0	)] =	12.46

WATER TO BE REMOVED

	Gallons of Water (well)		Gallons of Water (annulus)		Removal Multipler		Total Gallons to be Removed	Actual Gallons Removed
[(	7.81	+	12.46	)] x	5	=	101	101

MEASUREMENTS

Well Purging

Time	Number of Gallons Removed	pH	Conductivity	Temperature	Turbidity
1120	0	4.84	0.078	6.1	853
1325	101	4.71	0.059	8.7	436
Post Sampling 1400	101	4.87	0.056	8.1	481

Well	Well	Annulus*	Annulus*
	V well	dia	V annulus
1.5"	0.10gal/ft	4.0	0.29gal/ft
2"	0.17gal/ft	6.5	0.46gal/ft
		7.25	0.59gal/ft
		7.75	0.69gal/ft
		8.25	0.79gal/ft
4"	0.66gal/ft	8.25	0.64gal/ft
		10.25	1.06gal/ft
		12.25	1.63gal/ft
6"	1.5gal/ft	12.25	1.41gal/ft

SAMPLING

Sample ID	✓Analysis	Volume (ml)	Filtered (Y/N)	Preservation	Container	Time
01M0003YT	VOA	40mL	N	HCl	amber vial	1340
01M0003YV	VOA	40mL	N	HCl	amber vial	
01M0003YS	SVOA	1L.	N	Ice	amber jar	
01M0003ZM	FILT MET.	500mL	Y	HNO_3	HDPE	
01M0003YM	METALS	500mL	N	HNO_3	HDPE	
01M000YE	EXPLOSIVES	1L.	N	Ice	amber jar	

Notes (include data on floaters/sinkers with measuring device, well condition, etc.)

* Assumes 30% porosity

Signature HMWebber Date 2/26/93 No. of Bottles 6

Appendix F: Soldiers Lake Surface Water Sampling Logs

Arthur D Little	**Surface Water/Sediment Sampling Data Sheet**	Date 01/18/94 Client USAEC Project CGGM Case No. 67069

LOCATION

Sampling Location Discription LAKE ALLEN SLSW-2

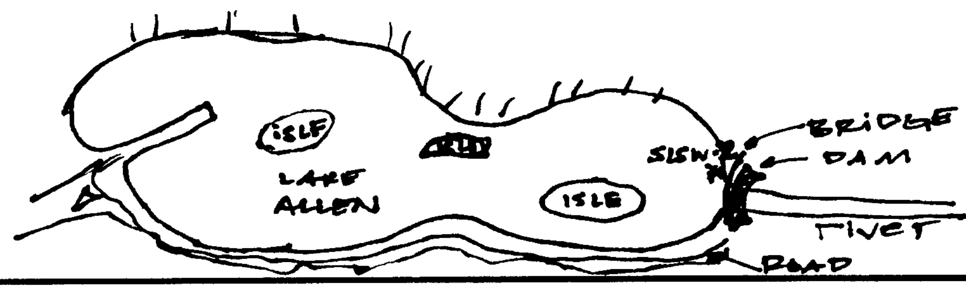
Type Of Water Body LAKE

Channel Width — Channel Depth 1.75ft Est. Flow —

Discharge Points (Y/N) Location

Odors, Surface Sheen ICE

LOCATION DIAGRAM (Indicate orientation, sampling locations, discharge/recharge points,etc.)



SLSW-2 TAKEN FROM EASTERLY END OF DAM.

SAMPLING PROCEDURE

Equipment Used (Calibrated Y/N) HORIBA

Solvent 1 Used Solvent 2 Used Other

Decontamination Procedures Used

- ☐ DI Water Rinse, Solvent 1 Rinse, Solvent 2 Rinse, Solvent 1 Rinse, DI Water Rinse
- ☐ DI Water Rinse, Solvent 1 Rinse, DI Water Rinse
- ☐ Detergent Wash, DI Water Rinse
- ☒ Other

~~GROUND~~ SURFACE WATER CHARACTERISTIC

TEMP	pH	COND	D.O.	FREE CL⁻ Y/N	TURB	TIME
3.7°C	5.83	0.342	—	—	16	1425

SAMPLING

SAMPLE	MATRIX	METHOD	VOLUME (ml)	FILTERED (Y/N)	PRESERV.	TIME
S1K4482YA (PEST)	W	GRAB	1000	N	ICE	1430
S1K4482YM (MET.)	W		500	N	HNO3	
S1K4482ZM (MET.)	W		500	Y		
Q1KD455YA (PEST)	W		1000	N	ICE	
Q1KD455YM (MET.)	W		500	N	HNO3	
Q1KD455ZM (MET.)	W		500	Y		

NOTES TOTAL DEPTH OF WATER COLUMN AT SAMPLING LOC. = 1.75'
ALSO COLLECTED DUPLICATE SAMPLE 94QC-455 AND FIELD BLANK 94QC-158

Signature [signature] Date 1/18/94 No. Of Bottles SIX

Arthur D Little	Surface Water/Sediment Sampling Data Sheet	Date 1/19/94 Client USAEC Project FGGM Case No. 67069

LOCATION

SLSW-1

Sampling Location Discription: Central Portion of Soldier/Allan Lake

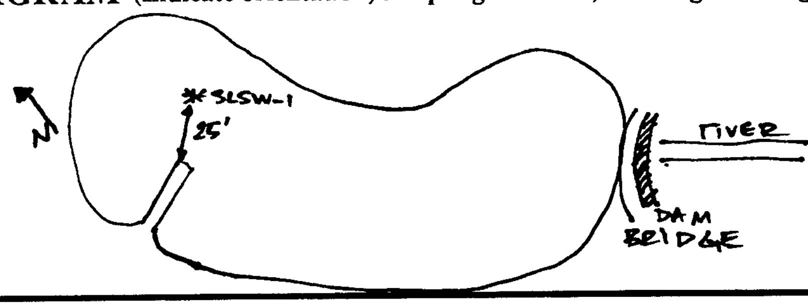
Type Of Water Body: Lake

Channel Width: ~50ft Channel Depth: UNK Est. Flow: —

Discharge Points (Y/N) Location: —

Odors, Surface Sheen: None observed

LOCATION DIAGRAM (Indicate orientation, sampling locations, discharge/recharge points,etc.)



SAMPLING PROCEDURE

Equipment Used (Calibrated Y/N): Horiba U-10 (Calibrated)

Solvent 1 Used ______ Solvent 2 Used ______ Other ______

Decontamination Procedures Used

- [ ] DI Water Rinse, Solvent 1 Rinse, Solvent 2 Rinse, Solvent 1 Rinse, DI Water Rinse
- [ ] DI Water Rinse, Solvent 1 Rinse, DI Water Rinse
- [ ] Detergent Wash, DI Water Rinse
- [x] Other

GROUND WATER CHARACTERISTIC

TEMP	pH	COND	D.O.	FREE CL⁻ Y/N	TURB	TIME
-1.0°C	6.54	0.716	–	–	8	1600

SAMPLING

SAMPLE	MATRIX	METHOD	VOLUME (ml)	FILTERED (Y/N)	PRESERV.	TIME
S1K00017A (Pest)	W	GRAB	1000	N	ice	1600
S1K00017M (Met)	W	↓	500	N	HNO3	"
S1K0001YM (Met)	W	↓	500	Y	HNO3	"

NOTES: Lake was frozen to a depth of ~5 inches below top of surface. An ice auger was used to bore down through the 5 inches of ice. Sample was collected immediately below the ice -- derived from the top 0-6" of the encountered water.

Signature: Shannon C. Stover Date: 1/19/94 No. Of Bottles: 3

Appendix G: Anne Arundel County Drilling Permits

Appendix G: Anne Arundel County Drilling Permits

FGGM Area	USAEC Site ID Code	County Permit #
DSY	MW-200 MW-201	AA-88-9138 AA-88-9139
FTA	FTAMW-1 FTAMW-2 FTAMW-3	AA-88-9132 AA-88-9133 AA-88-9134
HHA	HHAMW-6	AA-88-9147
ODA	ODAMW-1 ODAMW-2 ODAMW-3	AA-88-9135 AA-88-9136 AA-88-9137

C 1 4444 SEQUENCE NO. (DENV USE ONLY)
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 02

ST/CO USE ONLY DATE Received

DATE WELL COMPLETED 012893

Depth of Well 58 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" AA-88-9132

OWNER
last name first name
STREET OR RFD TOWN
SUBDIVISION SECTION LOT

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	Check if water bearing
Top Soil Fill	0'	2'	
[illegible] - silty [illegible]	2'	42'	
[illegible] - silty [illegible] sand	42'	59'	
[illegible] silty clay [illegible]	59'	67'	

CIRCLE APPROPRIATE LETTER
A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
E ELECTRIC LOG OBTAINED
P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS IDENT. NO. 492

DRILLERS SIGNATURE
(MUST MATCH SIGNATURE ON APPLICATION)

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes Y no N — Y
TYPE OF GROUTING MATERIAL
CEMENT CM BENTONITE CLAY BC
NO. OF BAGS 23 NO. OF POUNDS 2162
GALLONS OF WATER 138
DEPTH OF GROUT SEAL (to nearest foot)
from 0 ft. TOP to 35 ft. BOTTOM (enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below
ST STEEL CO CONCRETE PL PLASTIC OT OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL	4	48

EACH CASING
OTHER CASING (if used) diameter inch depth (feet) from to

SCREEN RECORD
screen type or open hole insert appropriate code below
ST STEEL BR BRASS BRONZE HO OPEN HOLE PL PLASTIC OT OTHER

C 2
EACH SCREEN

	Type	DEPTH (nearest ft.) from	to
1	PL	48	58
2			
3			

SLOT SIZE 1 .010 2 3
DIAMETER OF SCREEN 4 (NEAREST INCH)

GRAVEL PACK from 41 to 58
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

OEP USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
TELESCOPE CASING LOG INDICATOR OTHER DATA

C 3
PUMPING TEST
HOURS PUMPED (nearest hour) 0
PUMPING RATE (gal. per min. to nearest gal.) 0
METHOD USED TO MEASURE PUMPING RATE None
WATER LEVEL (distance from land surface)
BEFORE PUMPING 48
WHEN PUMPING 0
TYPE OF PUMP USED (for test)
A air P piston T turbine
C centrifugal R rotary O other (describe below)
J jet S submersible

PUMP INSTALLED
DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) YES NO
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS EXCEPT HOME USE
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX - SEE ABOVE:
CAPACITY: GALLONS PER MINUTE (to nearest gallon) 0
PUMP HORSE POWER 0
PUMP COLUMN LENGTH (nearest ft.) 0
CASING HEIGHT (circle appropriate box and enter casing height)
+ above / − below LAND SURFACE 2 (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND/OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)
N

DRILLER

EMERGENCY/TEMP NO. IF ANY

B 1 01647 SEQUENCE NO. (DP USE ONLY)

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
APPLICATION FOR PERMIT TO DRILL WELL

please print or type

STATE PERMIT NUMBER: AA-XX-9113A
70 *fill in this form completely* 79

Date Received (APA): 011292 (13)

OWNER INFORMATION

Last Name / Owner / First Name: US ARMY

Street or RFD: FT GEORGE G MEADE

Town: FORT MEADE State: Md Zip: 20755

DRILLER INFORMATION

Driller's Name: Ian A Volem License No.: 492

Firm Name / Address: 8918 Herrmann Dr Columbia Md 21045

Signature: Ian A Volem Date: 1-11-92

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.): 0

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY): 0

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- D HOME (SINGLE OR DOUBLE HOUSEHOLD UNIT ONLY)
- F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION)
- 22 I INDUSTRIAL, COMMERCIAL, STATE AND FEDERAL GOV. OTHER (REQUIRES APPROPRIATION PERMIT)
- P PUBLIC OR PRIVATE WATER COMPANY (REQUIRES APPROPRIATION PERMIT AND STATE HEALTH DEPARTMENT APPROVAL)
- T TEST, OBSERVATION, MONITORING (MAY REQUIRE APPROPRIATION PERMIT)

APPROXIMATE DEPTH OF WELL: 30 FEET

APPROXIMATE DIAMETER OF WELL: 4 NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) | JETTED | Jetted & DRIVEN
30 37 AIR-ROTary | AIR-PERcussion | ROTARY (Hydraulic Rotary)
CABLE | REVerse-ROTary | DRive-POINT

other ____

REPLACEMENT OR DEEPENED WELLS
(CIRCLE APPROPRIATE BOX)

- N THIS WELL WILL NOT REPLACE AN EXISTING WELL
- Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- 39 S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY
- D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENDED (IF AVAILABLE) 41 ____ 52

Not to be filled in by driller (OEP USE ONLY)

APPROP. PERMIT NUMBER: GAP

FORCE: AK WRITE INITIALS IN BOX PERMIT No.: AA-93-1138

B 3 LOCATION OF WELL

COUNTY: ANNE ARUNDEL

SUBDIVISION: ____

SECTION ____ LOT ____

NEAREST TOWN: FORT MEADE

MILES FROM TOWN (enter 0 if in town): 0 MI

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX): N, NE, E, SE, S, SW, W, NW — TOWN

NEAR WHAT ROAD: ROUTE 32

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX): NORTH N, WEST W, 32, E EAST, S SOUTH

DISTANCE FROM ROAD: 100 ENTER FT or MI: FT

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

COUNTY NAME: AA COUNTY NO.: 02

STATE SIGNATURE ____ INSERT S

DATE ISSUED: 011293 CO SIGNATURE: L Rose EXP. DATE

NORTH GRID: 456000 EAST GRID: 0870000

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

X

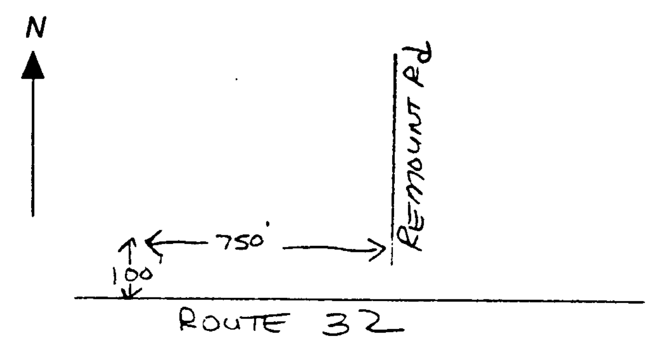
SOURCES OF DRILLING WATER
1. None
2. Required
3.

WRITE THE BOX NUMBER FROM THE MAP HERE

E 870
N 456

000
000

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



SPECIAL CONDITIONS

MW - 200

DRILLER

C 1 4445 SEQUENCE NO. (DENV USE ONLY)

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 02

ST/CO USE ONLY DATE Received

DATE WELL COMPLETED 020373

Depth of Well 36 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" AA-89-9137

OWNER US Army (last name / first name)

STREET OR RFD ____ TOWN Ft Meade 20755

SUBDIVISION ____ SECTION ____ LOT ____

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	Check if water bearing
Gravel ... steel ...	0'	4'	
Orange - silty white ... sand	4'	31'	✓
Tan - silty ... clay ... gravel	31'	36'	

CIRCLE APPROPRIATE LETTER
A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
E ELECTRIC LOG OBTAINED
P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS IDENT. NO. 49

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

MED 073

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes Y no N
TYPE OF GROUTING MATERIAL: CEMENT CM BENTONITE CLAY BC
NO. OF BAGS 7 NO. OF POUNDS 5??
GALLONS OF WATER 42
DEPTH OF GROUT SEAL (to nearest foot) from 0 ft. (TOP) to 15 ft. (BOTTOM) (enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: ST STEEL, CO CONCRETE, PL PLASTIC, OT OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL	4	26

OTHER CASING (if used): diameter inch / depth (feet) from / to

SCREEN RECORD
screen type or open hole insert appropriate code below: ST STEEL, BR BRASS BRONZE, HO OPEN HOLE, PL PLASTIC, OT OTHER

C 2

	Type	DEPTH from	DEPTH to
1	PL	26	36
2			
3			

SLOT SIZE 1 .010 2 ____ 3 ____

DIAMETER OF SCREEN 4 (NEAREST INCH)

GRAVEL PACK from 21 to 37

IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

OEP USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T TELESCOPE CASING; (E.R.O.S.) LOG INDICATOR; W Q OTHER DATA

C 3

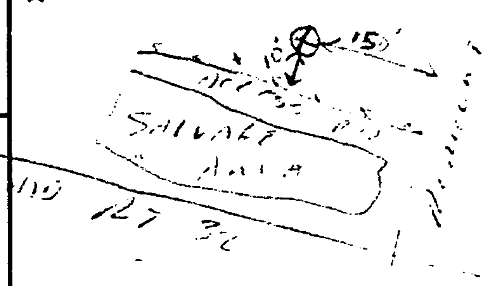
PUMPING TEST
HOURS PUMPED (nearest hour) 0
PUMPING RATE (gal. per min. to nearest gal.) 0
METHOD USED TO MEASURE PUMPING RATE None
WATER LEVEL (distance from land surface)
BEFORE PUMPING 29
WHEN PUMPING 0

TYPE OF PUMP USED (for test): A air, P piston, T turbine, C centrifugal, R rotary, O other (describe below), J jet, S submersible

Bailer

PUMP INSTALLED
DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) YES NO
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS EXCEPT HOME USE
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX - SEE ABOVE:
CAPACITY: GALLONS PER MINUTE (to nearest gallon) 0
PUMP HORSE POWER 0
PUMP COLUMN LENGTH (nearest ft.) 0
CASING HEIGHT (circle appropriate box and enter casing height) + above / − below LAND SURFACE 2 (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND/OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



DRILLER

B 1 01648 SEQUENCE NO. (DP USE ONLY)
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
APPLICATION FOR PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER
AA-88-9139
fill in this form completely

Date Received (APA) 011792 (14)

OWNER INFORMATION

Last Name Owner First Name: US ARMY
Street or RFD: FT GEORGE G MEADE
Town: FORT MEADE State: MD Zip: 20755

DRILLER INFORMATION

Driller's Name: Ian A Volem License No. 492
Firm Name: ATEC
Address: 8918 Herrmann Dr Columbia Md 21045
Signature: Ian a Volem Date: 1-11-92

B 2

WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.) 0
AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY) 0

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- D HOME (SINGLE OR DOUBLE HOUSEHOLD UNIT ONLY)
- F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION)
- I INDUSTRIAL, COMMERCIAL, STATE AND FEDERAL GOV. OTHER (REQUIRES APPROPRIATION PERMIT)
- P PUBLIC OR PRIVATE WATER COMPANY (REQUIRES APPROPRIATION PERMIT AND STATE HEALTH DEPARTMENT APPROVAL)
- T TEST, OBSERVATION, MONITORING (MAY REQUIRE APPROPRIATION PERMIT)

APPROXIMATE DEPTH OF WELL 30 FEET

APPROXIMATE DIAMETER OF WELL 4 NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) JETTED Jetted & DRIVEN
AIR-ROTary AIR-PERcussion ROTARY (Hydraulic Rotary)
CABLE REVerse-ROTary DRive-POINT
other

REPLACEMENT OR DEEPENED WELLS
(CIRCLE APPROPRIATE BOX)

- N THIS WELL WILL NOT REPLACE AN EXISTING WELL
- Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY
- D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENDED (IF AVAILABLE)

Not to be filled in by driller (OEP USE ONLY)

APPROP. PERMIT NUMBER GAP

FORCE LK WRITE INITIALS IN BOX PERMIT No. AA-88-9139

B 3

LOCATION OF WELL

COUNTY: ANNE ARUNDEL
SUBDIVISION:
SECTION LOT
NEAREST TOWN: FORT MEADE
MILES FROM TOWN (enter 0 if in town) 0 MI

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX): N NE E SE S SW W NW TOWN

NEAR WHAT ROAD: RT 32

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX): NORTH N, WEST W, 32, E EAST, S SOUTH

DISTANCE FROM ROAD 350
ENTER FT or MI FT

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

COUNTY NAME: AA COUNTY NO. 02
STATE SIGNATURE INSERT S
DATE ISSUED 011292 CO SIGNATURE L Ross EXP. DATE
NORTH GRID 456000 EAST GRID 0870000

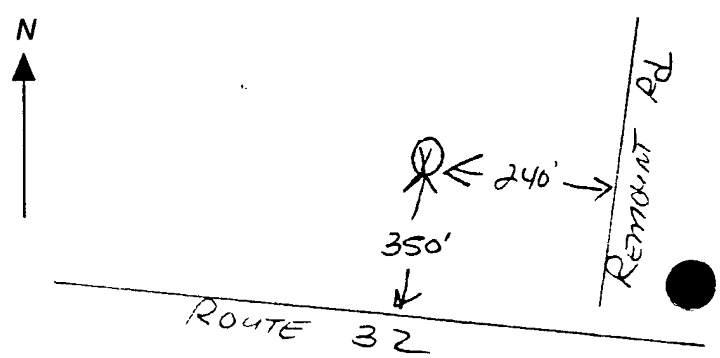
SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

X

SOURCES OF DRILLING WATER
1. None
2. required
3.

WRITE THE BOX NUMBER FROM THE MAP HERE
E 870
N 456
000
000

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



SPECIAL CONDITIONS

MW 201

DRILLER

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

C 1 4438 — SEQUENCE NO. (DENV USE ONLY)
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 02

ST/CO USE ONLY
DATE Received

DATE WELL COMPLETED 0 1 2 1 9 3

Depth of Well 14 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" AA-88-9132

OWNER US Army
last name — first name
STREET OR RFD Fort Meade — TOWN Ft. Meade 20755
SUBDIVISION ______ SECTION ______ LOT ______

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	Check if water bearing
gravel	0	.5	
tan moist fine sand	.5	12.5	✓
Gray BLK silty clay	12.5	15.0	

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS IDENT. NO. 492

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes **Y** / no N
TYPE OF GROUTING MATERIAL: CEMENT CM — BENTONITE CLAY BC
NO. OF BAGS 2 — NO. OF POUNDS 100
GALLONS OF WATER 10
DEPTH OF GROUT SEAL (to nearest foot) from 0 ft. (TOP) to 2 ft. (BOTTOM) (enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: ST STEEL, CO CONCRETE, PL PLASTIC, OT OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL	4	4

EACH CASING — OTHER CASING (if used): diameter inch; depth (feet) from / to

SCREEN RECORD
screen type or open hole insert appropriate code below: ST STEEL, BR BRASS BRONZE, HO OPEN HOLE, PL PLASTIC, OT OTHER

C 2

EACH SCREEN	Type	DEPTH (nearest ft.) from	to
1	PL	4	14
2			
3			

SLOT SIZE 1 .010 2 ___ 3 ___
DIAMETER OF SCREEN 4 (NEAREST INCH)

GRAVEL PACK from 3 to 15
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

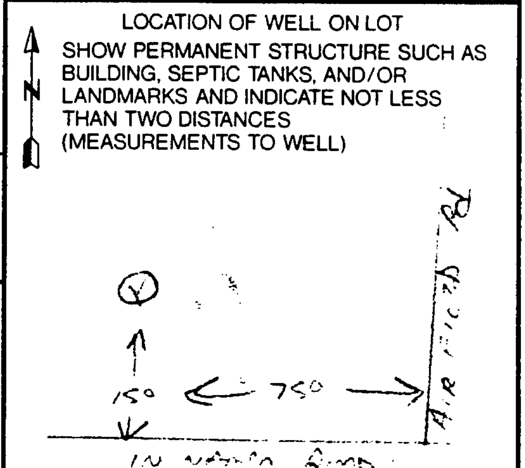
OEP USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T — TELESCOPE CASING; (E.R.O.S.) LOG INDICATOR; W Q OTHER DATA

C 3

PUMPING TEST
HOURS PUMPED (nearest hour) 1
PUMPING RATE (gal. per min. to nearest gal.) 0
METHOD USED TO MEASURE PUMPING RATE NA
WATER LEVEL (distance from land surface)
BEFORE PUMPING 4
WHEN PUMPING 6
TYPE OF PUMP USED (for test): A air, P piston, T turbine, C centrifugal, R rotary, O other (describe below), J jet, **S submersible**

PUMP INSTALLED
DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO): YES **NO**
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS EXCEPT HOME USE
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX - SEE ABOVE:
CAPACITY: GALLONS PER MINUTE (to nearest gallon)
PUMP HORSE POWER
PUMP COLUMN LENGTH (nearest ft.)
CASING HEIGHT (circle appropriate box and enter casing height): **+ above** / − below LAND SURFACE 3 (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND/OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



B | 104031 SEQUENCE NO. (DP USE ONLY)

1 2 3 4 6 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND

APPLICATION FOR PERMIT TO DRILL WELL

please print or type

AA-93-9132

70 *fill in this form completely* 79

Date Received (APA) 011293

8 13

OWNER INFORMATION

US ARMY

15 Last Name Owner First Name 34

FT GEORGE G MEADE

36 Street or RFD 55

FORT MEADE md 20755

57 Town 70 State 72 Zip 76

DRILLER INFORMATION

Ian A Volem 492

Driller's Name 77 License No. 80

ATEC

Firm Name

8918 Herrmann Dr Columbia Md 21045

Address

Ian A Volem 12-31-92

Signature Date

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.) 0

8 12

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY) 0

14 20

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- D HOME (SINGLE OR DOUBLE HOUSEHOLD UNIT ONLY)
- F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION)
- 22 I INDUSTRIAL, COMMERCIAL, STATE AND FEDERAL GOV. OTHER (REQUIRES APPROPRIATION PERMIT)
- P PUBLIC OR PRIVATE WATER COMPANY (REQUIRES APPROPRIATION PERMIT AND STATE HEALTH DEPARTMENT APPROVAL)
- T TEST, OBSERVATION, MONITORING (MAY REQUIRE APPROPRIATION PERMIT)

APPROXIMATE DEPTH OF WELL 30 FEET

24 28

APPROXIMATE DIAMETER OF WELL 4 NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) JETTED Jetted & DRIVEN

30 37 AIR-ROTary AIR-PERcussion ROTARY (Hydraulic Rotary)

CABLE REVerse-ROTary DRive-POINT

other

REPLACEMENT OR DEEPENED WELLS

(CIRCLE APPROPRIATE BOX)

- N THIS WELL WILL NOT REPLACE AN EXISTING WELL
- Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- 39 S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY
- D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENDED (IF AVAILABLE) 41 52

Not to be filled in by driller (OEP USE ONLY)

APPROP. PERMIT NUMBER GAP

54 63

FORCE AL WRITE INITIALS IN BOX PERMIT No. AA-93-9132

67 68 70 71 72 73 74 75 76 77 78 79

B 3 LOCATION OF WELL

ANNE ARUNDEL

8 COUNTY 21

23 SUBDIVISION 42

SECTION 44 46 LOT 48 50

FORT GEORGE G MEADE

52 NEAREST TOWN 71

MILES FROM TOWN (enter 0 if in town) 0 MI

73 76 77 78

B 4 DIRECTION OF WELL FROM TOWN (CIRCLE BOX)

N 8, NE 8-9, E 8, SE 8-9, S 8, SW 8-9, W 8, NW 8-9, TOWN

AIRFIELD Rd

11 NEAR WHAT ROAD 30

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX) NORTH N, WEST W, 32, EAST E, SOUTH S

34 750 37

DISTANCE FROM ROAD

ENTER FT or MI FT

38 39

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

AA 02

COUNTY NAME COUNTY NO.

STATE SIGNATURE INSERT S 41

DATE ISSUED 011293 I Rose

43 48 CO SIGNATURE EXP. DATE

NORTH GRID 456000 EAST GRID 0866000

50 55 57 63

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

X

SOURCES OF DRILLING WATER

1. none
2. required
3.

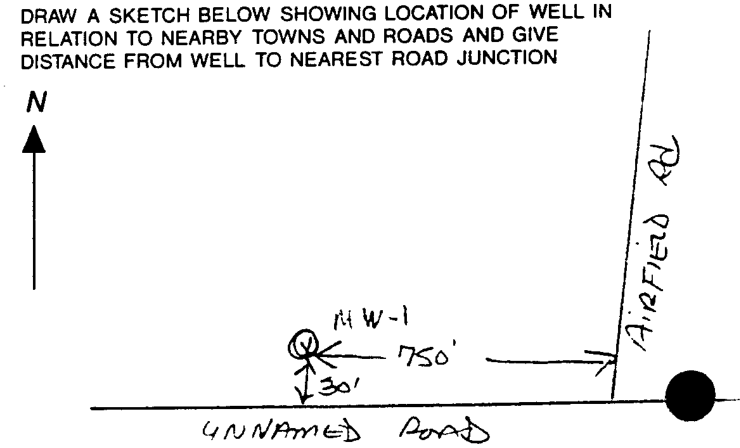
WRITE THE BOX NUMBER FROM THE MAP HERE

E 866

N 456

000
000

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



SPECIAL CONDITIONS

FTA MW - 1

DRILLER

CT 4439 | SEQUENCE NO. (DEN USE ONLY)
1 2 3 6
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 02

ST/CO USE ONLY DATE Received [ ] 8 13

DATE WELL COMPLETED 0 1 2 0 9 3 (15–20)

Depth of Well 22 1 4 26 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" AA-88-7133 (28–37)

OWNER US Army
last name first name
STREET OR RFD Fort Meade TOWN Fort Meade 20755
SUBDIVISION SECTION LOT

WELL LOG

Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	Check if water bearing
Tan Mid Sand	0	14	✓
Grey Black Silty Clay	14	17	

CIRCLE APPROPRIATE LETTER

- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS IDENT. NO. 492

[signature]
DRILLERS SIGNATURE
(MUST MATCH SIGNATURE ON APPLICATION)

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD

WELL HAS BEEN GROUTED (Circle Appropriate Box) yes Y (44) no N (44)
TYPE OF GROUTING MATERIAL
CEMENT CM (45 46) BENTONITE CLAY BC (45 46)
NO. OF BAGS 2 NO. OF POUNDS 188
GALLONS OF WATER 10
DEPTH OF GROUT SEAL (to nearest foot)
from 0 ft. (48 TOP 52) to 2 ft. (54 BOTTOM 58)
(enter 0 if from surface)

CASING RECORD

casing types insert appropriate code below
ST STEEL | CO CONCRETE | PL PLASTIC | OT OTHER

MAIN CASING TYPE: P L (60 61)
Nominal diameter top (main) casing (nearest inch): 4 (63 64)
Total depth of main casing (nearest foot): 4 (66 70)

EACH CASING — OTHER CASING (if used)
diameter inch | depth (feet) from | to

SCREEN RECORD

screen type or open hole insert appropriate code below
ST STEEL | BR BRASS BRONZE | HO OPEN HOLE | PL PLASTIC | OT OTHER

C 2 (1 2)

EACH SCREEN — DEPTH (nearest ft.)

1: P L (8 9) | 4 (11–15) | 14 (17–21)
2: (23 24) | (26–30) | (32–36)
3: (38 39) | (41–45) | (47–51)

SLOT SIZE 010 2.____ 3.____

DIAMETER OF SCREEN 4 (56–60) (NEAREST INCH)

GRAVEL PACK from 3 to 17

IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68 [ ]

OEP USE ONLY
(NOT TO BE FILLED IN BY DRILLER)

T 70 [ ] TELESCOPE CASING | (E.R.O.S.) 72 [ ] LOG INDICATOR | W Q 74 75 76 [ ] OTHER DATA

DRILLER

C 3 (1 2)

PUMPING TEST

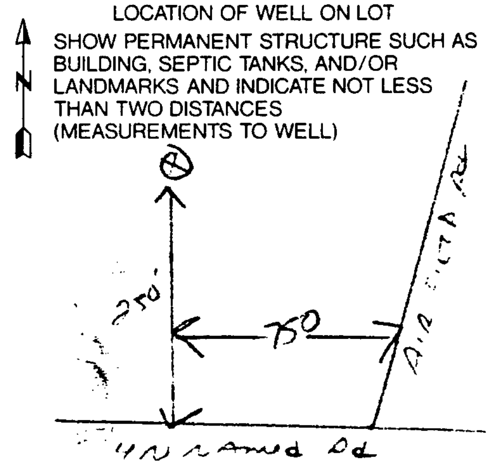
HOURS PUMPED (nearest hour) 1 (8 9)
PUMPING RATE (gal. per min. to nearest gal.) 0 (11–15)
METHOD USED TO MEASURE PUMPING RATE NA
WATER LEVEL (distance from land surface)
BEFORE PUMPING 4 (17–20)
WHEN PUMPING 6 (22–25)
TYPE OF PUMP USED (for test)
A air | P piston | T turbine
C centrifugal | R rotary | O other (describe below)
J jet | S submersible (circled)

PUMP INSTALLED

DRILLER WILL INSTALL PUMP YES NO (circled: NO)
(CIRCLE) (YES or NO)
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS EXCEPT HOME USE
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX - SEE ABOVE: [ ] 29
CAPACITY: GALLONS PER MINUTE (to nearest gallon) (31–35)
PUMP HORSE POWER (37–41)
PUMP COLUMN LENGTH (nearest ft.) (43–47)
CASING HEIGHT (circle appropriate box and enter casing height)
+ above (49) LAND SURFACE
− below (49) 2 (50 51) (nearest foot)

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND/OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



FTAMW-2

B	1 01641	SEQUENCE NO. (DP USE ONLY)

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
APPLICATION FOR PERMIT TO DRILL WELL

please print or type

STATE PERMIT NUMBER: AA-93-9133

fill in this form completely

Date Received (APA): 011293 (03)

OWNER INFORMATION

Last Name / Owner / First Name: US ARMY

Street or RFD: FT GEORGE G MEADE

Town: FORT MEADE State: MD Zip: 20755

LOCATION OF WELL

B 3

COUNTY: ANNE ARUNDEL

SUBDIVISION:

SECTION: LOT:

NEAREST TOWN: FORT GEORGE G MEADE

MILES FROM TOWN (enter 0 if in town): 0 MI

DRILLER INFORMATION

Driller's Name: Ian A Volem License No.: 492

Firm Name: ATEC

Address: 8918 Herrmann Dr Columbia Md 21045

Signature: Ian A Volem Date: 1-11-92

WELL INFORMATION

B 2

APPROX. PUMPING RATE (GAL. PER MIN.): 0

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY): 0

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX): N, NE, E, SE, S, SW, W, NW — TOWN

NEAR WHAT ROAD: Airfield Rd

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX): NORTH, WEST (circled), EAST, SOUTH

DISTANCE FROM ROAD: 750

ENTER FT or MI: FT

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- D HOME (SINGLE OR DOUBLE HOUSEHOLD UNIT ONLY)
- F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION)
- I INDUSTRIAL, COMMERCIAL, STATE AND FEDERAL GOV. OTHER (REQUIRES APPROPRIATION PERMIT)
- P PUBLIC OR PRIVATE WATER COMPANY (REQUIRES APPROPRIATION PERMIT AND STATE HEALTH DEPARTMENT APPROVAL)
- T TEST, OBSERVATION, MONITORING (MAY REQUIRE APPROPRIATION PERMIT) (circled)

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

COUNTY NAME: AA COUNTY NO.: 02

STATE SIGNATURE: INSERT S

DATE ISSUED: 011293 CO SIGNATURE: L. R... EXP. DATE

NORTH GRID: 456000 EAST GRID: 0866000

APPROXIMATE DEPTH OF WELL: 30 FEET

APPROXIMATE DIAMETER OF WELL: 4 NEAREST INCH

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

SOURCES OF DRILLING WATER
1. NONE
2. Required
3.

WRITE THE BOX NUMBER FROM THE MAP HERE

E 866
N 456

000
000

x

METHOD OF DRILLING (circle one)

BORED (or Augered) (circled) — JETTED — Jetted & DRIVEN — AIR-ROTary — AIR-PERcussion — ROTARY (Hydraulic Rotary) — CABLE — REVerse-ROTary — DRive-POINT

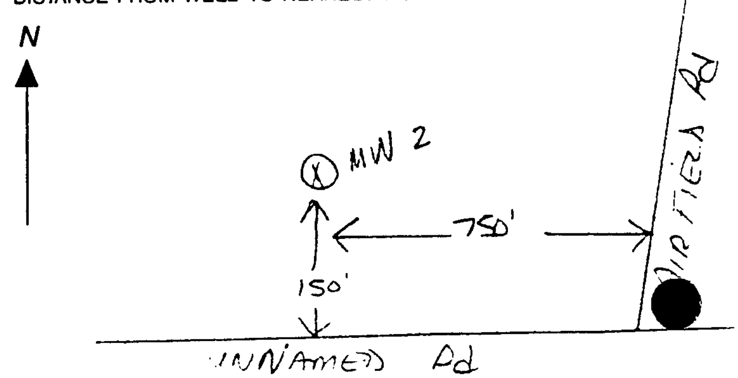
other

REPLACEMENT OR DEEPENED WELLS
(CIRCLE APPROPRIATE BOX)

- N THIS WELL WILL NOT REPLACE AN EXISTING WELL (circled)
- Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY
- D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE):

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



Not to be filled in by driller (OEP USE ONLY)

APPROP. PERMIT NUMBER: GAP

FORCE: LK (WRITE INITIALS IN BOX) PERMIT No.: AA-93-9123

SPECIAL CONDITIONS

FTAMW-2

DRILLER

C1 4440 SEQUENCE NO. (DENV USE ONLY)
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 02

ST/CO USE ONLY DATE Received

DATE WELL COMPLETED 012093

Depth of Well 14 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" AA-88-9134

OWNER US Army
last name first name
STREET OR RFD Fort George G Meade TOWN md 20755
SUBDIVISION SECTION LOT

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	Check if water bearing
TAN MOIST Mod Sand	0	14	✓
Blk Grey silt to clay	14	15	

CIRCLE APPROPRIATE LETTER
A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
E ELECTRIC LOG OBTAINED
P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS IDENT. NO. 452

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes Y (circled) no N
TYPE OF GROUTING MATERIAL
CEMENT CM BENTONITE CLAY BC
NO. OF BAGS 2 NO. OF POUNDS 188
GALLONS OF WATER 10
DEPTH OF GROUT SEAL (to nearest foot)
from 0 ft. (TOP) to 2 ft. (BOTTOM) (enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below
ST STEEL, CO CONCRETE, PL PLASTIC, OT OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL	4	4

EACH CASING — OTHER CASING (if used): diameter inch; depth (feet) from, to

SCREEN RECORD
screen type or open hole insert appropriate code below
ST STEEL, BR BRASS BRONZE, HO OPEN HOLE, PL PLASTIC, OT OTHER

C2

EACH SCREEN	Type	DEPTH (nearest ft.) from	to
1	PL	4	14
2			
3			

SLOT SIZE .001 2 3
DIAMETER OF SCREEN 4 (NEAREST INCH)

GRAVEL PACK from 3 to 15
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

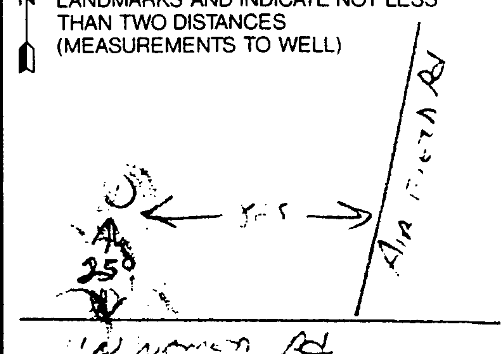
OEP USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
TELESCOPE CASING, LOG INDICATOR, OTHER DATA

C3

PUMPING TEST
HOURS PUMPED (nearest hour) 1
PUMPING RATE (gal. per min. to nearest gal.) 0
METHOD USED TO MEASURE PUMPING RATE NA
WATER LEVEL (distance from land surface)
BEFORE PUMPING 4
WHEN PUMPING 6
TYPE OF PUMP USED (for test)
A air, P piston, T turbine, C centrifugal, R rotary, O other (describe below), J jet, S submersible (circled)

PUMP INSTALLED
DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) YES NO (circled)
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS EXCEPT HOME USE
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX - SEE ABOVE:
CAPACITY: GALLONS PER MINUTE (to nearest gallon)
PUMP HORSE POWER
PUMP COLUMN LENGTH (nearest ft.)
CASING HEIGHT (circle appropriate box and enter casing height) + above (circled) − below LAND SURFACE 3 (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND/OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



DRILLER

B 1 | 01632 | SEQUENCE NO. (DP USE ONLY)

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
APPLICATION FOR PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: AA-88-9134

fill in this form completely

Date Received (APA): 011293

OWNER INFORMATION

Last Name / Owner / First Name: US ARMY

Street or RFD: FT GEORGE G MEADE

Town: FORT MEADE State: MD Zip: 20755

DRILLER INFORMATION

Driller's Name: Ian A Volen License No.: 492

Firm Name: ATEC

Address: 8918 Herrmann Dr Columbia Md 21045

Signature: Ian A Volen Date: 12-31-92

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.): 0

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY): 0

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- D HOME (SINGLE OR DOUBLE HOUSEHOLD UNIT ONLY)
- F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION)
- I INDUSTRIAL, COMMERCIAL, STATE AND FEDERAL GOV. OTHER (REQUIRES APPROPRIATION PERMIT)
- P PUBLIC OR PRIVATE WATER COMPANY (REQUIRES APPROPRIATION PERMIT AND STATE HEALTH DEPARTMENT APPROVAL)
- T TEST, OBSERVATION, MONITORING (MAY REQUIRE APPROPRIATION PERMIT)

APPROXIMATE DEPTH OF WELL: 30 FEET

APPROXIMATE DIAMETER OF WELL: 4 NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) | JETTED | Jetted & DRIVEN
AIR-ROTary | AIR-PERcussion | ROTARY (Hydraulic Rotary)
CABLE | REVerse-ROTary | DRive-POINT

other ______

REPLACEMENT OR DEEPENED WELLS
(CIRCLE APPROPRIATE BOX)

- N THIS WELL WILL NOT REPLACE AN EXISTING WELL
- Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY
- D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE): ______

Not to be filled in by driller (OEP USE ONLY)

APPROP. PERMIT NUMBER: GAP

FORCE: [illegible] (WRITE INITIALS IN BOX) PERMIT No.: AA-88-9134

B 3 LOCATION OF WELL

COUNTY: ANNE ARUNDEL

SUBDIVISION: ______

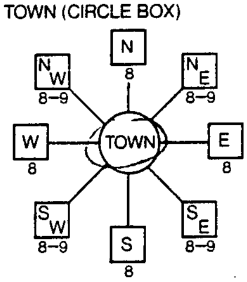
SECTION ______ LOT ______

NEAREST TOWN: FORT GEORGE G MEADE

MILES FROM TOWN (enter 0 if in town): 0 MI

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



NEAR WHAT ROAD: Airfield Rd

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX): NORTH / WEST / EAST / SOUTH

DISTANCE FROM ROAD: 825

ENTER FT or MI: FT

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

COUNTY NAME: AA COUNTY NO.: 02

STATE SIGNATURE ______ INSERT S

DATE ISSUED: 011293 CO SIGNATURE: L Rose EXP. DATE

NORTH GRID: 456000 EAST GRID: 086600

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

X

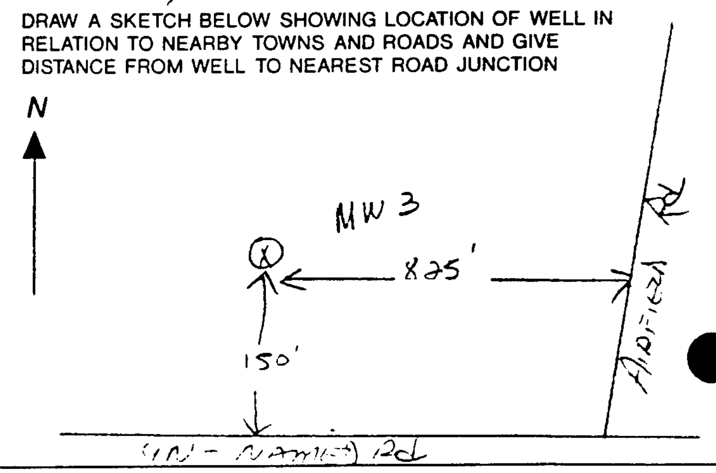
000
000

SOURCES OF DRILLING WATER
1. None
2. required
3.

WRITE THE BOX NUMBER FROM THE MAP HERE

E 866
N 456

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



SPECIAL CONDITIONS

FTAMW-3

DRILLER

4423 SEQUENCE NO. (DENV USE ONLY)
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 02

ST/CO USE ONLY DATE Received

DATE WELL COMPLETED

Depth of Well 17 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" AA-82-9147

OWNER U.S. Army
last name first name

STREET OR RFD TOWN Fort Meade

SUBDIVISION SECTION LOT

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	Check if water bearing
Asphalt	0	4"	
Sub Base Crush Stone	4"	12"	
Silt Sand-Silty	1'		✓
F. to C. Sand			
F. to C. Gravel		17'	

CIRCLE APPROPRIATE LETTER
A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
E ELECTRIC LOG OBTAINED
P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS IDENT. NO. 61

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)
William ... WD 023

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes Y / no N — Y
TYPE OF GROUTING MATERIAL
CEMENT CM   BENTONITE CLAY BC
NO. OF BAGS   NO. OF POUNDS
GALLONS OF WATER
DEPTH OF GROUT SEAL (to nearest foot) from 0 ft. to 5 ft. (enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: ST STEEL, CO CONCRETE, PL PLASTIC, OT OTHER

MAIN CASING TYPE: PL
Nominal diameter top (main) casing (nearest inch): 4
Total depth of main casing (nearest foot): 7

OTHER CASING (if used) diameter inch, depth (feet) from to

SCREEN RECORD
screen type or open hole insert appropriate code below: ST STEEL, BR BRASS BRONZE, HO OPEN HOLE, PL PLASTIC, OT OTHER

C2
1: PL — DEPTH (nearest ft.) 7 — 17

SLOT SIZE 1 .010 2 3
DIAMETER OF SCREEN 4 (NEAREST INCH)

GRAVEL PACK from 6 to 17
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

OEP USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T TELESCOPE CASING   (E.R.O.S.) LOG INDICATOR   W Q OTHER DATA

C3
PUMPING TEST
HOURS PUMPED (nearest hour) 0
PUMPING RATE (gal. per min. to nearest gal.) 0
METHOD USED TO MEASURE PUMPING RATE None
WATER LEVEL (distance from land surface)
BEFORE PUMPING 7
WHEN PUMPING 0
TYPE OF PUMP USED (for test): A air, P piston, T turbine, C centrifugal, R rotary, O other (describe below), J jet, S submersible — O
Bailer

PUMP INSTALLED
DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) — NO
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS EXCEPT HOME USE
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX - SEE ABOVE:
CAPACITY: GALLONS PER MINUTE (to nearest gallon) 0
PUMP HORSE POWER 0
PUMP COLUMN LENGTH (nearest ft.) 0
CASING HEIGHT (circle appropriate box and enter casing height) + above / − below LAND SURFACE 0 (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND/OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)

DRILLER

HHA-MW-MW #1F

EMERGENCY/TEMP NO. IF ANY

B 1 101635 SEQUENCE NO. (DP USE ONLY)

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
APPLICATION FOR PERMIT TO DRILL WELL

please print or type

STATE PERMIT NUMBER: AA-88-9147

fill in this form completely

Date Received (APA): 011293 (22)

OWNER INFORMATION

Last Name / Owner / First Name: US ARMY

Street or RFD: FT GEORGE G MEADE

Town: FORT MEADE State: MD Zip: 20755

DRILLER INFORMATION

Driller's Name: Ian A Volen License No.: 492

Firm Name: ATEE

Address: 8918 Herrmann Dr Columbia Md 21045

Signature: Ian A Volen Date: 1-11-92

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.): 0

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY): 0

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- D HOME (SINGLE OR DOUBLE HOUSEHOLD UNIT ONLY)
- F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION)
- I INDUSTRIAL, COMMERCIAL, STATE AND FEDERAL GOV. OTHER (REQUIRES APPROPRIATION PERMIT)
- P PUBLIC OR PRIVATE WATER COMPANY (REQUIRES APPROPRIATION PERMIT AND STATE HEALTH DEPARTMENT APPROVAL)
- T TEST, OBSERVATION, MONITORING (MAY REQUIRE APPROPRIATION PERMIT)

APPROXIMATE DEPTH OF WELL: 30 FEET

APPROXIMATE DIAMETER OF WELL: 4 NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) | JETTED | Jetted & DRIVEN
AIR-ROTary | AIR-PERcussion | ROTARY (Hydraulic Rotary)
CABLE | REVerse-ROTary | DRive-POINT

other ______

REPLACEMENT OR DEEPENED WELLS
(CIRCLE APPROPRIATE BOX)

- N THIS WELL WILL NOT REPLACE AN EXISTING WELL
- Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY
- D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE): ______

Not to be filled in by driller (OEP USE ONLY)

APPROP. PERMIT NUMBER: GAP

FORCE: AK (WRITE INITIALS IN BOX) PERMIT No.: AA-88-9147

B 3 LOCATION OF WELL

COUNTY: ANNE ARUNDEL

SUBDIVISION: ______

SECTION: ___ LOT: ___

NEAREST TOWN: FORT GEORGE G MEADE

MILES FROM TOWN (enter 0 if in town): 0 MI

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX): N, NE, E, SE, S, SW, W, NW — TOWN

NEAR WHAT ROAD: ODENTON Rd

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX): NORTH N, WEST W, 32, EAST E, SOUTH S

DISTANCE FROM ROAD: 500 ENTER FT or MI: FT

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

COUNTY NAME: AA COUNTY NO.: 02

STATE SIGNATURE ______ INSERT S

DATE ISSUED: 011293 CO SIGNATURE: L Rose EXP. DATE

NORTH GRID: 456000 EAST GRID: 880000

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

X

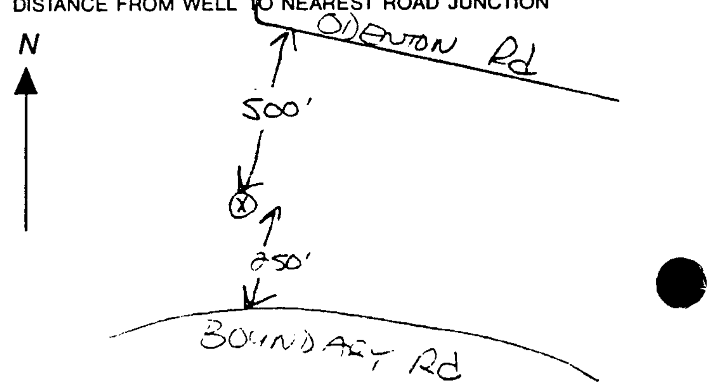
000
000

SOURCES OF DRILLING WATER
1. None
2.
3. required

WRITE THE BOX NUMBER FROM THE MAP HERE

E 880
N 456

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



SPECIAL CONDITIONS

HHA
MWL

DRILLER

C 1 4441 SEQUENCE NO. (DEN USE ONLY)
1 2 3 6
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 02

ST/CO USE ONLY
DATE Received [ ] 13

DATE WELL COMPLETED 01 25 93 (15–20)

Depth of Well 22 13 26 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" AA-88-1135 (28–37)

OWNER U.S. Army
last name first name
STREET OR RFD ______ TOWN [illegible]
SUBDIVISION ______ SECTION ______ LOT ______

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	Check if water bearing
Topsoil	0'	1'	
Tan orange silty fine sand	1'	8'	✓
white silty clay fine sand	8'	9'	
Tan-silty white fine sand	9'	13'	

CIRCLE APPROPRIATE LETTER
A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
E ELECTRIC LOG OBTAINED
P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS IDENT. NO. 472
[signature]
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)
[signature]
SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes Y no N (44)
TYPE OF GROUTING MATERIAL
CEMENT CM (45 46) BENTONITE CLAY BC (45 46)
NO. OF BAGS 3 NO. OF POUNDS 282
GALLONS OF WATER 18
DEPTH OF GROUT SEAL (to nearest foot)
from 0 (48 TOP 52) ft. to 2 (54 BOTTOM 58) ft.
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below
ST STEEL CO CONCRETE PL PLASTIC OT OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL (60 61)	4 (63 64)	6 (66–70)

EACH CASING
OTHER CASING (if used)

diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole insert appropriate code below
ST STEEL BR BRASS BRONZE HO OPEN HOLE PL PLASTIC OT OTHER

C 2
1 2

EACH SCREEN

	Type	DEPTH (nearest ft.) from	to
1	PL (8 9)	3 (11–15)	13 (17–21)
2	(23 24)	(26–30)	(32–36)
3	(38 39)	(41–45)	(47–51)

SLOT SIZE 1 .010 2 ___ 3 ___
DIAMETER OF SCREEN 4 (56–60) (NEAREST INCH)

GRAVEL PACK from 2 to 13
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68 [ ] 68

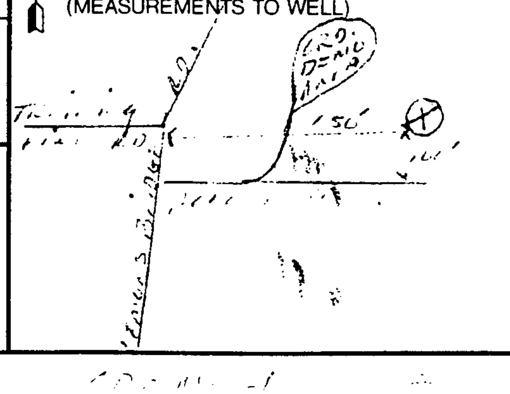
OEP USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T 70 [ ] TELESCOPE CASING
(E.R.O.S.) 72 [ ] LOG INDICATOR
W Q 74 75 76 [ ] OTHER DATA

C 3
1 2

PUMPING TEST
HOURS PUMPED (nearest hour) 0 (8 9)
PUMPING RATE (gal. per min. to nearest gal.) 0 (11–15)
METHOD USED TO MEASURE PUMPING RATE None
WATER LEVEL (distance from land surface)
BEFORE PUMPING 3 (17–20)
WHEN PUMPING 0 (22–25)
TYPE OF PUMP USED (for test)
A air P piston T turbine
C centrifugal R rotary O other (describe below)
J jet S submersible
Bailer

PUMP INSTALLED
DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) YES NO
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS EXCEPT HOME USE
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX - SEE ABOVE: [ ] 29
CAPACITY: GALLONS PER MINUTE (to nearest gallon) 0 (31–35)
PUMP HORSE POWER 0 (37–41)
PUMP COLUMN LENGTH (nearest ft.) 0 (43–47)
CASING HEIGHT (circle appropriate box and enter casing height)
+ above (49) / − below (49) LAND SURFACE 2 (50 51) (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND/OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



DRILLER

B 1 01650 SEQUENCE NO. (DP USE ONLY)
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
APPLICATION FOR PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: AA-93-1135
fill in this form completely

Date Received (APA): 011293

OWNER INFORMATION

Last Name / Owner / First Name: US FISH + WILDLIFE SVC
Street or RFD: PATUXENT WILDLIFE CTR
Town: LAUREL State: MD Zip: 20708

DRILLER INFORMATION

Driller's Name: Ian A Volem License No. 452
Firm Name: ATEC
Address: 8918 Herrmann Dr Columbia MD 21045
Signature: Ian A Volem Date: 1-11-92

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.): 0
AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY): 0

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- D HOME (SINGLE OR DOUBLE HOUSEHOLD UNIT ONLY)
- F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION)
- I INDUSTRIAL, COMMERCIAL, STATE AND FEDERAL GOV. OTHER (REQUIRES APPROPRIATION PERMIT)
- P PUBLIC OR PRIVATE WATER COMPANY (REQUIRES APPROPRIATION PERMIT AND STATE HEALTH DEPARTMENT APPROVAL)
- T TEST, OBSERVATION, MONITORING (MAY REQUIRE APPROPRIATION PERMIT)

APPROXIMATE DEPTH OF WELL: 30 FEET

APPROXIMATE DIAMETER OF WELL: 4 NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) | JETTED | Jetted & DRIVEN
AIR-ROTary | AIR-PERcussion | ROTARY (Hydraulic Rotary)
CABLE | REVerse-ROTary | DRive-POINT
other ______

REPLACEMENT OR DEEPENED WELLS
(CIRCLE APPROPRIATE BOX)

- N THIS WELL WILL NOT REPLACE AN EXISTING WELL
- Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY
- D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE): ______

Not to be filled in by driller (OEP USE ONLY)

APPROP. PERMIT NUMBER: GAP
FORCE: LR (WRITE INITIALS IN BOX) PERMIT No. AA-93-1135

B 3 LOCATION OF WELL

COUNTY: ANNE ARUNDEL
SUBDIVISION: ______
SECTION ___ LOT ___
NEAREST TOWN: FORT MEADE
MILES FROM TOWN (enter 0 if in town): 0 MI

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX): N, NE, E, SE, S, SW, W, NW — TOWN

NEAR WHAT ROAD: LEMONS BRIDGE Rd

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX): NORTH N, WEST W, 32, EAST E, SOUTH S

DISTANCE FROM ROAD: 200
ENTER FT or MI: FT

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

COUNTY NAME: AA COUNTY NO. 02
STATE SIGNATURE ______ INSERT S
DATE ISSUED: 011293 CO SIGNATURE: L Rose EXP. DATE
NORTH GRID: 440000 EAST GRID: 0868000

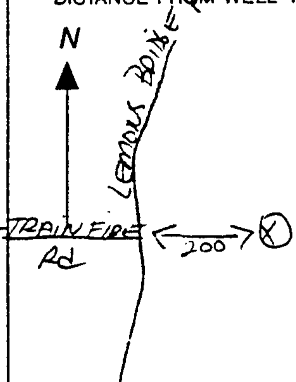
SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

SOURCES OF DRILLING WATER
1. None
2. Required
3.

WRITE THE BOX NUMBER FROM THE MAP HERE
E 868
N 440

000
000
X

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



SPECIAL CONDITIONS

ODAMW-1

DRILLER

C1 4442 SEQUENCE NO. (DENV USE ONLY)
1 2 3 6
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 02

ST/CO USE ONLY
DATE Received [ ] 13

DATE WELL COMPLETED 012593 (15–20)

Depth of Well 22 14 26 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" AA-88-6136 (28–37)

OWNER U S Army
last name first name
STREET OR RFD ______ TOWN Ft Meade 20755
SUBDIVISION ______ SECTION ______ LOT ______

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	Check if water bearing
Topsoil	0'	1'	
Tan - silty Orange fine sand	1'	14'	

CIRCLE APPROPRIATE LETTER
A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
E ELECTRIC LOG OBTAINED
P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS IDENT. NO. 492

DRILLERS SIGNATURE
(MUST MATCH SIGNATURE ON APPLICATION)

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee) 14 LO 673

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes Y (44) no N (44) — Y circled
TYPE OF GROUTING MATERIAL
CEMENT CM (45 46) — circled; BENTONITE CLAY BC (45 46)
NO. OF BAGS 2 NO. OF POUNDS 188
GALLONS OF WATER 12
DEPTH OF GROUT SEAL (to nearest foot)
from 0 ft. (48 TOP 52) to 2 ft. (54 BOTTOM 58)
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below
ST STEEL; CO CONCRETE; PL PLASTIC (circled); OT OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL (60 61)	4 (63 64)	6 (66–70)

EACH CASING — OTHER CASING (if used)
diameter inch / depth (feet) from to

SCREEN RECORD
screen type or open hole insert appropriate code below
ST STEEL; BR BRASS BRONZE; HO OPEN HOLE; PL PLASTIC; OT OTHER

C2
1 2

EACH SCREEN — DEPTH (nearest ft.)

	Type	From	To
1	PL (8 9)	4 (11–15)	14 (17–21)
2	(23 24)	(26–30)	(32–36)
3	(38 39)	(41–45)	(47–51)

SLOT SIZE 1 .010 2 ___ 3 ___
DIAMETER OF SCREEN 4 (56–60) (NEAREST INCH)

GRAVEL PACK from 3 to 14
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68 [ ]

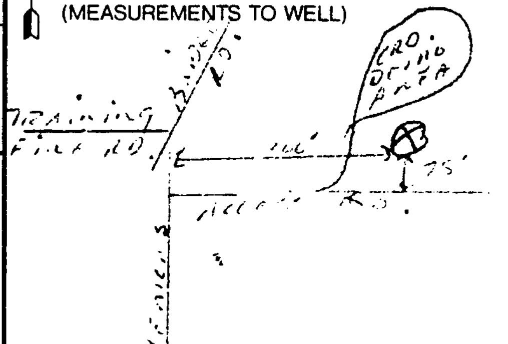
OEP USE ONLY
(NOT TO BE FILLED IN BY DRILLER)
T 70 [ ] TELESCOPE CASING
(E.R.O.S.) 72 [ ] LOG INDICATOR
W Q 74 75 76 [ ] OTHER DATA

C3
1 2

PUMPING TEST
HOURS PUMPED (nearest hour) 0 (8 9)
PUMPING RATE (gal. per min. to nearest gal.) 0 (11–15)
METHOD USED TO MEASURE PUMPING RATE NONE
WATER LEVEL (distance from land surface)
BEFORE PUMPING 4 (17–20)
WHEN PUMPING 0 (22–25)
TYPE OF PUMP USED (for test)
A air (27); P piston (27); T turbine (27); C centrifugal (27); R rotary (27); Ø other (describe below) (27) — circled; J jet (27); S submersible (27)
Bailer

PUMP INSTALLED
DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) YES NO — NO circled
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS EXCEPT HOME USE
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX - SEE ABOVE: [ ] 29
CAPACITY: GALLONS PER MINUTE (to nearest gallon) 0 (31–35)
PUMP HORSE POWER 0 (37–41)
PUMP COLUMN LENGTH (nearest ft.) 0 (43–47)
CASING HEIGHT (circle appropriate box and enter casing height)
+ above (49) — circled; − below (49) LAND SURFACE 2 (50 51) (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND/OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



DRILLER

B 1 01651 SEQUENCE NO. (DP USE ONLY)

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND APPLICATION FOR PERMIT TO DRILL WELL

please print or type

STATE PERMIT NUMBER: AA-93-9136

fill in this form completely

Date Received (APA): 011293

OWNER INFORMATION

Last Name / Owner / First Name: US FISH + WILDLIFE SVC

Street or RFD: PATUXENT WILDLIFE CTR

Town: LAUREL State: MD Zip: 20708

DRILLER INFORMATION

Driller's Name: Ian A Volen License No.: 492

Firm Name: ATEC

Address: 8918 Herrmann Dr Columbia Md 21045

Signature: Ian A Volen Date: 1-11-92

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.): 0

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY): 0

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- D HOME (SINGLE OR DOUBLE HOUSEHOLD UNIT ONLY)
- F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION)
- I INDUSTRIAL, COMMERCIAL, STATE AND FEDERAL GOV. OTHER (REQUIRES APPROPRIATION PERMIT)
- P PUBLIC OR PRIVATE WATER COMPANY (REQUIRES APPROPRIATION PERMIT AND STATE HEALTH DEPARTMENT APPROVAL)
- T TEST, OBSERVATION, MONITORING (MAY REQUIRE APPROPRIATION PERMIT)

APPROXIMATE DEPTH OF WELL: 30 FEET

APPROXIMATE DIAMETER OF WELL: 4 NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) JETTED Jetted & DRIVEN

AIR-ROTary AIR-PERcussion ROTARY (Hydraulic Rotary)

CABLE REVerse-ROTary DRive-POINT

other

REPLACEMENT OR DEEPENED WELLS

(CIRCLE APPROPRIATE BOX)

- N THIS WELL WILL NOT REPLACE AN EXISTING WELL
- Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY
- D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE)

Not to be filled in by driller (OEP USE ONLY)

APPROP. PERMIT NUMBER: GAP

FORCE: AK (WRITE INITIALS IN BOX) PERMIT No.: AA-93-9136

B 3 LOCATION OF WELL

COUNTY: ANNE ARUNDEL

SUBDIVISION:

SECTION: LOT:

NEAREST TOWN: FORT MEADE

MILES FROM TOWN (enter 0 if in town): 0 MI

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX): N NE E SE S SW W NW TOWN

NEAR WHAT ROAD: Lemons Bridge Rd

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX): NORTH N, WEST W, 32, E EAST, S SOUTH

DISTANCE FROM ROAD: 350

ENTER FT or MI: FT

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

COUNTY NAME: AA COUNTY NO.: 02

STATE SIGNATURE: INSERT S

DATE ISSUED: 011292 CO SIGNATURE: L Rice EXP. DATE

NORTH GRID: 440000 EAST GRID: 0868000

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

SOURCES OF DRILLING WATER
1. None
2. Required
3.

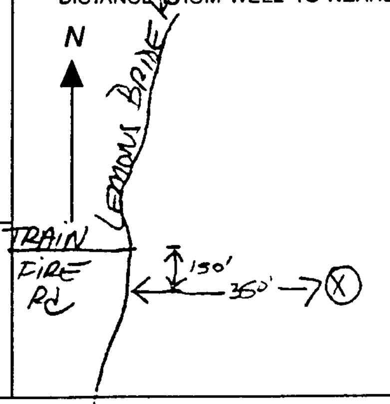
WRITE THE BOX NUMBER FROM THE MAP HERE

E 868
N 440

000
000

X

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



SPECIAL CONDITIONS

ODAMW-2

DRILLER

C 1 4443 SEQUENCE NO. (DENV USE ONLY)

1 2 6

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 02.

ST/CO USE ONLY
DATE Received [ ] 13

DATE WELL COMPLETED 0 1 2 6 9 3 (15–20)

Depth of Well 22 1 5 26 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" AA-92-9137 (28–37)

OWNER US Army
last name first name

STREET OR RFD ______ TOWN ______

SUBDIVISION ______ SECTION ______ LOT ______

WELL LOG
Not required for driven wells
STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	Check if water bearing
TOPSOIL	0'	1'	
Tan-orange silty clayey fine sand	1'	15'	✓

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS IDENT. NO. 194

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD

WELL HAS BEEN GROUTED (Circle Appropriate Box) yes Y (44) no N (44)

TYPE OF GROUTING MATERIAL
CEMENT C/M (45 46) BENTONITE CLAY B C (45 46)

NO. OF BAGS 2 NO. OF POUNDS 182

GALLONS OF WATER 12

DEPTH OF GROUT SEAL (to nearest foot)
from 0 ft. (48 TOP 52) to 2 ft. (54 BOTTOM 58)
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below
ST STEEL — CO CONCRETE — PL PLASTIC — OT OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL (60 61)	4 (63 64)	7 (66–70)

EACH CASING — OTHER CASING (if used)
diameter inch — depth (feet) from — to

SCREEN RECORD
screen type or open hole insert appropriate code below
ST STEEL — BR BRASS BRONZE — HO OPEN HOLE — PL PLASTIC — OT OTHER

C 2

EACH SCREEN — DEPTH (nearest ft.)

	Type	From	To
1	PL (8 9)	5 (11–15)	15 (17–21)
2	(23 24)	(26–30)	(32–36)
3	(38 39)	(41–45)	(47–51)

SLOT SIZE 1 .010 2 ____ 3 ____

DIAMETER OF SCREEN 4 (56–60) (NEAREST INCH)

GRAVEL PACK from 4 to 16

IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

OEP USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (70) TELESCOPE CASING — (E.R.O.S.) (72) LOG INDICATOR — W Q (74 75 76) OTHER DATA

C 3

PUMPING TEST

HOURS PUMPED (nearest hour) 0 (8 9)

PUMPING RATE (gal. per min. to nearest gal.) 0 (11–15)

METHOD USED TO MEASURE PUMPING RATE None

WATER LEVEL (distance from land surface)
BEFORE PUMPING 6 (17–20)
WHEN PUMPING 0 (22–25)

TYPE OF PUMP USED (for test)
A air — P piston — T turbine — C centrifugal — R rotary — O other (describe below) — J jet — S submersible (27)

Bailer

PUMP INSTALLED

DRILLER WILL INSTALL PUMP YES NO
(CIRCLE) (YES or NO)
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS EXCEPT HOME USE

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX - SEE ABOVE: (29)

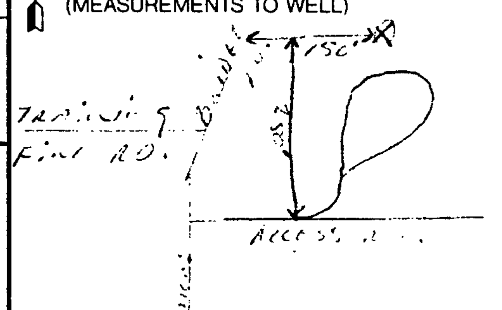
CAPACITY: GALLONS PER MINUTE (to nearest gallon) 0 (31–35)

PUMP HORSE POWER 0 (37–41)

PUMP COLUMN LENGTH (nearest ft.) 0 (43–47)

CASING HEIGHT (circle appropriate box and enter casing height)
+ above (49) / − below (49) LAND SURFACE 2 (50 51) (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND/OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



DRILLER

B	1	01652	SEQUENCE NO. (DP USE ONLY)

1 2 3 6 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
APPLICATION FOR PERMIT TO DRILL WELL

please print or type

STATE PERMIT NUMBER: AA-93-9137

70 fill in this form completely 79

Date Received (APA): 01193 (8–13)

OWNER INFORMATION

Last Name / Owner / First Name (15–34): US FISH + WILDLIFE SVC

Street or RFD (36–55): PATUXENT WILDLIFE CTR

Town (57): LAUREL — State (70–72): MD — Zip (76): 20708

DRILLER INFORMATION

Driller's Name: Ian A Volenz — License No. (77–80): 492

Firm Name: ATEC

Address: 8918 Herrmann Dr Columbia MD 21045

Signature: Ian A Volenz — Date: 1-11-93

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.) (8–12): 0

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY) (14–20): 0

USE FOR WATER (CIRCLE APPROPRIATE BOX)

22

- D HOME (SINGLE OR DOUBLE HOUSEHOLD UNIT ONLY)
- F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION)
- I INDUSTRIAL, COMMERCIAL, STATE AND FEDERAL GOV. OTHER (REQUIRES APPROPRIATION PERMIT)
- P PUBLIC OR PRIVATE WATER COMPANY (REQUIRES APPROPRIATION PERMIT AND STATE HEALTH DEPARTMENT APPROVAL)
- T TEST, OBSERVATION, MONITORING (MAY REQUIRE APPROPRIATION PERMIT)

APPROXIMATE DEPTH OF WELL (24–28): 30 FEET

APPROXIMATE DIAMETER OF WELL: 4 NEAREST INCH

METHOD OF DRILLING (circle one)

30 37

BORED (or Augered)	JETTED	Jetted & DRIVEN
AIR-ROTary	AIR-PERcussion	ROTARY (Hydraulic Rotary)
CABLE	REVerse-ROTary	DRive-POINT

other ______

REPLACEMENT OR DEEPENED WELLS
(CIRCLE APPROPRIATE BOX)

39

- N THIS WELL WILL NOT REPLACE AN EXISTING WELL
- Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY
- D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE) 41 ______ 52

Not to be filled in by driller (OEP USE ONLY)

APPROP. PERMIT NUMBER (54–63): GAP

FORCE (67–68): [illegible] — WRITE INITIALS IN BOX — PERMIT No. (70–79): AA-93-9137

B 3 LOCATION OF WELL

8 COUNTY (21): ANNE ARUNDEL

23 SUBDIVISION (42):

SECTION (44–46): ______ LOT (48–50): ______

52 NEAREST TOWN (71): FORT MEADE

MILES FROM TOWN (enter 0 if in town) (73–78): 0 MI

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX): NW, N, NE, W, TOWN, E, SW, S, SE

NEAR WHAT ROAD (11–30): LEMONS BRIDGE

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX): NORTH N, WEST W, 32, EAST E, SOUTH S

DISTANCE FROM ROAD (34–37): 225

ENTER FT or MI (38–39): FT

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

COUNTY NAME: AA — COUNTY NO.: 02

STATE SIGNATURE ______ INSERT S (41)

DATE ISSUED (43–48): 011293 — CO SIGNATURE: [illegible] — EXP. DATE

NORTH GRID (50–55): 440000 — EAST GRID (57–63): 0568000

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X →

SOURCES OF DRILLING WATER
1. None
2.
3. Required

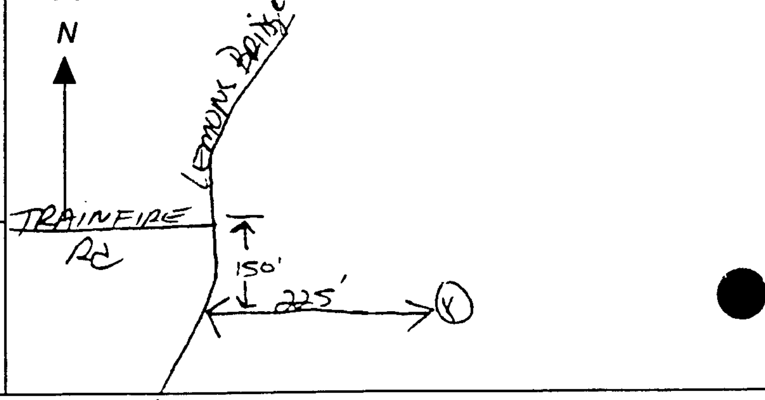
WRITE THE BOX NUMBER FROM THE MAP HERE

E: 568
N: 440

000
000

X

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



SPECIAL CONDITIONS

ODAMW-3

DRILLER

Appendix H: DPDO Salvage Yard and Transformer Storage Analytical Results
(DPDO currently known as DRMO)

Table DSY-1: PCBs in Surficial Soil at the DSY
Table DSY-2: Field Screening and Metals Data for Ground Water from the DSY
Table DSY-3: Volatile Organic Compounds in Ground Water from the DSY
Table DSY-4: Semivolatile Organic Compounds in Ground Water from the DSY

Note: The term "LT" indicates that a certified analyte is not detected. The term "ND" is used for analytes that are added to certified methods but have not gone through the certification process. The term "LT" is followed by the certified reporting limit, it does not signify that a compound was actually detected but not included because results were below the Contract Required Detection Limit.

Table DSY-1: PCBs in Surficial Soil at the DSY
Fort George G. Meade, Maryland

Sample Location Identification	SS-200		93QC-400		SS-201		SS-202		SS-203		SS-204		SS-205	
Field Sample ID	D1A0200Y		Q1AD400Y		D1A0201Y		D1A0202Y		D1A0203Y		D1A0204Y		D1A0205Y	
Start Depth (ft bgs)	0		0		0		0		0		0		0	
End Depth (ft bgs)	0.5		0.5		0.5		0.5		0.5		0.5		0.5	
Media	CSO		CSO		CSO		CSO		CSO		CSO		CSO	
QC Type			Dup. of SS-200											
PCBs (ug/g)														
PCB 1016	0.1	LT	0.1	LT	0.1	LT	0.1	LT	0.1	LT	0.1	LT	0.1	LT
PCB 1221	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND
PCB 1232	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND
PCB 1242	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND
PCB 1248	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND
PCB 1254	0.048	ND	0.048	ND	0.048	ND	0.048	ND	0.048	ND	0.048	ND	0.048	ND
PCB 1260	0.314		0.271		4		0.752		0.599		1.53		0.048	LT
TOTAL PCBs	**3.1**		**0.27**		**4**		**0.75**		**0.6**		**2**		**0**	
Collection Date:	02-Feb-93		02-Feb-93		02-Feb-93		02-Feb-93		03-Feb-93		03-Feb-93		03-Feb-93	
Extraction Date:	04-Feb-93		04-Feb-93		04-Feb-93		04-Feb-93		09-Feb-93		09-Feb-93		09-Feb-93	
Analysis Date:	09-Feb-93		09-Feb-93		09-Feb-93		09-Feb-93		17-Feb-93		17-Feb-93		17-Feb-93	

Notes
(1)LT = less than detection limit; ND = Not Detected

TABLE DSY-2: Field Screening and Metals Data for Ground Water from the DSY
Fort George G. Meade, Maryland
Page 1 of 2

Sample Location Identification	COE-1	COE-1	MW-42	MW-42	93QC-452	93QC-452	MW-43D	MW-43D
Field Sample ID	D1M0001Y	D1M0001Z	D1M0042Y	D1M0042Z	Q1XD452Y	Q1XD452Z	D1M043DY	D1M043DZ
Site Type	WELL	WELL	WELL	WELL	WELL	WELL	WELL	WELL
Screen Start Depth (ft bgs)	24.5	24.5	35	35	35	35	82	82
Screen End Depth (ft bgs)	34.5	34.5	45	45	45	45	92	92
Media	CGW	CGW	CGW	CGW	CGW	CGW	CGW	CGW
Total/Dissovled	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
QC Type					Duplicate of MW-42			
FIELD PARAMETERS								
pH	4.33		4.85				4.72	
Conductivity(umhos/cm2)	0.196		0.303				0.595	
Temperature(C)	12.7		12.1				9.8	
Turbidity(NTU)	5		0				2	
METALS (ug/L)								
Aluminum	2240	136	12300	197	26900	191	249	112 LT
Antimony	60 LT	60 LT	60 LT	60 LT	60 LT	60 LT	60 LT	60 LT
Arsenic	2.35 LT	2.35 LT	4.35	2.35 LT	7.78	2.35 LT	2.35 LT	2.35 LT
Barium	94	83.4	193	104	255	101	238	216
Beryllium	1.12 LT	1.12 LT	1.12 LT	1.12 LT	1.2	1.12 LT	1.12 LT	1.12 LT
Boron	230 LT	230 LT	457	410	500	354	230 LT	230 LT
Cadmium	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT
Calcium	12300	11900	28200	27100	28500	22900	32700	30000
Chromium	16.8 LT	16.8 LT	254	98.1	344	91.6	16.8 LT	19.1
Cobalt	25 LT	25 LT	25 LT	25 LT	25 LT	25 LT	25 LT	25 LT
Copper	21.8	18.8 LT	56.5	18.8 LT	97.4	18.8 LT	18.8 LT	18.8 LT
Iron	9130	286	34800	99.9	55800	77.5 LT	203	84.4
Lead	4.47 LT	4.47 LT	11.7	4.47 LT	15.1	4.47 LT	4.47 LT	4.47 LT
Magnesium	4040	4090	12100	10900	13100	10100	7690	6920
Manganese	60.1	60.8	158	131	181	122	179	67.3
Mercury	0.1 LT	0.1 LT	0.1 LT	0.1 LT	0.126	0.1 LT	0.1 LT	0.1 LT
Molybdenum	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT
Nickel	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT
Potassium	3410	2570	5620	4030	6910	3290	15200	13900
Selenium	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT
Silver	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT
Sodium	17600	19400	10100	9850	9890	8460	75000	71000
Tellurium	118 LT	118 LT	118 LT	118 LT	118 LT	118 LT	118 LT	118 LT
Thallium	125 LT	125 LT	125 LT	125 LT	125 LT	125 LT	125 LT	125 LT
Tin	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT
Vanadium	27.6 LT	27.6 LT	65.6	27.6 LT	114	27.6 LT	27.6 LT	27.6 LT
Zinc	67.5	71.4	127	105	125	80.8	38.3	25.7
TOTAL HEAVY METALS (1)	**0**	**0**	**270**	**98**	**368**	**92**	**0**	**19**
TOTAL METALS	**48963**	**38598**	**104447**	**53025**	**142741**	**45690**	**131497**	**122233**
Collection Date:	23-Feb-93	23-Feb-93	24-Feb-93	24-Feb-93	24-Feb-93	24-Feb-93	24-Feb-93	24-Feb-93

Notes:
(1) Heavy Metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag; LT = less than detection limit; ND = Not Detected

TABLE DSY-2: Field Screening and Metals Data for Ground Water from the DSY
Fort George G. Meade, Maryland
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Sample Location Identification	MW-43S	MW-43S	MW-200	MW-200	MW-201	MW-201	93QC-153	93QC-253
Field Sample ID	D1M043SY	D1M043SZ	D1M0200Y	D1M0200Z	D1M0201Y	D1M0201Z	Q1XF153Y	Q1XF153Y
Site Type	WELL	WELL	WELL	WELL	WELL	WELL	FBLK	RNSW
Screen Start Depth (ft bgs)	30	30	47	47	26	26	-	-
Screen End Depth (ft bgs)	40	40	57	57	36	36	-	-
Media	CGW	CGW	CGW	CGW	CGW	CGW	CSW	CSW
Total/Dissovled	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Total
QC Type							Field Blank	Rinse Water
FIELD PARAMETERS								
pH	4.21		4.46		4.68		NA	NA
Conductivity(umhos/cm2)	0.778		0.226		0.181		NA	NA
Temperature(C)	11.7		11.9		12		NA	NA
Turbidity(NTU)	0		2		>999		NA	NA
METALS (ug/L)								
Aluminum	18100	1460	1430	112 LT	5810	139	112 LT	112 LT
Antimony	60 LT	60 LT	60 LT	60 LT	60 LT	60 LT	60 LT	60 LT
Arsenic	8.29	2.35 LT	2.35 LT	2.35 LT	3.98	2.35 LT	2.35 LT	2.35 LT
Barium	173	106	107	105	110	49.4	2.82 LT	2.82 LT
Beryllium	1.45	1.12 LT	1.12 LT	1.12 LT	1.12 LT	1.12 LT	1.12 LT	1.12 LT
Boron	230 LT	367	267	296	230 LT	230 LT	230 LT	230 LT
Cadmium	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT
Calcium	26000	25500	19100	25100	12700	12900	105 LT	105 LT
Chromium	98.5	16.8 LT	16.8 LT	16.8 LT	18.2	16.8 LT	16.8 LT	16.8 LT
Cobalt	25 LT	25 LT	25 LT	25 LT	25 LT	25 LT	25 LT	25 LT
Copper	89.5	18.8 LT	37.4	18.8 LT	18.8 LT	18.8 LT	18.8 LT	18.8 LT
Iron	57200	180	3530	118	5010	77.5 LT	77.5 LT	263
Lead	19.4	4.47 LT	4.47 LT	4.47 LT	4.47 LT	4.47 LT	4.47 LT	4.47 LT
Magnesium	11900	11300	5180	5710	7050	6910	135 LT	135 LT
Manganese	310	290	112	104	158	134	9.67 LT	9.67 LT
Mercury	0.859	0.1 LT	0.1 LT	0.1 LT	0.1 LT	0.1 LT	0.1 LT	0.1 LT
Molybdenum	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT
Nickel	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT
Potassium	5140	3780	5700	6550	4290	3530	1240 LT	1240 LT
Selenium	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT
Silver	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT
Sodium	97000	90000	8560	9710	19600	20100	279 LT	279 LT
Tellurium	118 LT	118 LT	118 LT	118 LT	118 LT	118 LT	118 LT	118 LT
Thallium	125 LT	125 LT	125 LT	125 LT	125 LT	125 LT	125 LT	125 LT
Tin	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT
Vanadium	116	27.6 LT	27.6 LT	27.6 LT	27.6 LT	27.6 LT	27.6 LT	27.6 LT
Zinc	298	316	39.7	41.2	286	186	18 LT	18 LT
TOTAL HEAVY METALS (1)	**128**	**0**	**0**	**0**	**22**	**0**	**0**	**0**
TOTAL METALS	**216455**	**133299**	**44063**	**47734**	**55036**	**43948**	**0**	**263**
Collection Date:	24-Feb-93	24-Feb-93	23-Feb-93	23-Feb-93	18-Mar-93	18-Mar-93	23-Feb-93	23-Feb-93

Notes:
(1) Heavy Metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag; LT = less than detection limit; ND = Not Detected

TABLE DSY-3: Volatile Organic Compounds in Ground Water from the DSY
Fort George G. Meade, Maryland

Sample Location Identification	COE-1	MW-42	93QC-452	MW-43D	MW-43S	MW-200
Field Sample ID	D1M0001	D1M0042	Q1XD452	D1M043D	D1M043S	D1M0200
Site Type	WELL	WELL	WELL	WELL	WELL	WELL
Screen Start Depth (ft bgs)	24.5(2)	35(2)	35(2)	82(2)	30(2)	47
Screen End Depth (ft bgs)	34.5(2)	45(2)	45(2)	92(2)	40(2)	57
Media	CGW	CGW	CGW	CGW	CGW	CGW
QC Type			Dup. of MW-42			
VOLATILE ORGANIC COMPOUNDS(ug/L)						
AROMATICS						
Benzene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Toluene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Ethylbenzene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,3-Dimethylbenzene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Xylenes	2 LT	2 LT	2 LT	2 LT	2 LT	2 LT
Styrene	5 ND	5 ND	5 ND	5 ND	5 ND	5 ND
CHLORINATED AROMATICS						
Chlorobenzene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,3-Dichlorobenzene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Dichlorobenzene, Nonspecific	2 LT	2 LT	2 LT	2 LT	2 LT	2 LT
HALOGENATED ORGANICS						
Chloromethane	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT
Bromomethane	14 LT	14 LT	14 LT	14 LT	14 LT	14 LT
Vinyl Chloride	12 LT	12 LT	12 LT	12 LT	12 LT	12 LT
Chloroethane	8 LT	8 LT	8 LT	8 LT	8 LT	8 LT
Methylene Chloride	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,1-Dichloroethene	1 LT	12	11	1 LT	1 LT	1 LT
1,1-Dichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,2-Dichloroethylenes	5 LT	5 LT	5 LT	5 LT	5 LT	5 LT
Chloroform	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,2-Dichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,1,1-Trichloroethane	1 LT	34	33	1 LT	1 LT	22
Carbon Tetrachloride	1 LT	1 LT	1 LT	1 LT	1.7	1 LT
Bromodichloromethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,2-Dichloropropane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Trichloroethene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,3-Dichloropropane	4.8 LT	4.8 LT	4.8 LT	4.8 LT	4.8 LT	4.8 LT
Dibromochloromethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,1,2-Trichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
2-Chloroethylvinyl Ether	3.5 LT	3.5 LT	3.5 LT	3.5 LT	3.5 LT	3.5 LT
Bromoform	11 LT	11 LT	11 LT	11 LT	11 LT	11 LT
1,1,2,2-Tetrachloroethane	1.5 LT	1.5 LT	1.5 LT	1.5 LT	1.5 LT	1.5 LT
Tetrachloroethene	1 LT	49	46	1 LT	2.7	150 GT
Carbon Disulfide	5 ND	5 ND	5 ND	5 ND	5 ND	5 ND
Cis-1,3-Dichloropropene	5 ND	5 ND	5 ND	5 ND	5 ND	5 ND
Trans-1,3-Dichloropropene	5 ND	5 ND	5 ND	5 ND	5 ND	5 ND
WATER SOLUBLE						
Acetone	8 LT	8 LT	8 LT	8 LT	8 LT	8 LT
2-Butanone	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT
4-Methyl-2-Pentanone	1.4 LT	1.4 LT	1.4 LT	1.4 LT	1.4 LT	1.4 LT
2-Hexanone	1 ND	1 ND	1 ND	1 ND	1 ND	1 ND
OTHER						
Acrylonitrile	8.4 LT	8.4 LT	8.4 LT	8.4 LT	8.4 LT	8.4 LT
Trichlorofluoromethane	1 LT	6.3	6	1 LT	1 LT	7.8
Vinyl Acetate	1 ND	1 ND	1 ND	1 ND	1 ND	1 ND
TOTAL VOCs	**0**	**102**	**96**	**0**	**4**	**180**
Collection Date:	23-Feb-93	24-Feb-93	24-Feb-93	24-Feb-93	24-Feb-93	23-Feb-93
Extraction Date:	06-Mar-93	07-Mar-93	07-Mar-93	07-Mar-93	01-Apr-93	06-Mar-93
Analysis Date:	06-Mar-93	07-Mar-93	07-Mar-93	07-Mar-93	01-Apr-93	06-Mar-93

NOTES:
(1) LT= Less than detection limits; ND= Not detected, GT = Greater than detection limit
(2) Depth based on total depth measurements assuming a 10-ft screen and a 2.5-ft stickup (no well log available)

TABLE DSY-3: Volatile Organic Compounds in Ground Water from the DSY
Fort George G. Meade, Maryland

Sample Location Identification	MW-201		93QC-153		93QC-253	
Field Sample ID	D1M0201		Q1XF153Y		Q1XR253Y	
Site Type	WELL		FBLK		RNSW	
Screen Start Depth (ft bgs)	26		-		-	
Screen End Depth (ft bgs)	36		-		-	
Media	CGW		CSW		CSW	
QC Type			Field Blank		Rinse Water	
VOLATILE ORGANIC COMPOUNDS(ug/L)						
AROMATICS						
Benzene	1	LT	1	LT	1	LT
Toluene	1	LT	1	LT	1	LT
Ethylbenzene	1	LT	1	LT	1	LT
1,3-Dimethylbenzene	1	LT	1	LT	1	LT
Xylenes	2	LT	2	LT	2	LT
Styrene	5	ND	5	ND	5	ND
CHLORINATED AROMATICS						
Chlorobenzene	1	LT	1	LT	1	LT
1,3-Dichlorobenzene	1	LT	1	LT	1	LT
Dichlorobenzene, Nonspecific	2	LT	2	LT	2	LT
HALOGENATED ORGANICS						
Chloromethane	1.2	LT	1.2	LT	1.2	LT
Bromomethane	14	LT	14	LT	14	LT
Vinyl Chloride	12	LT	12	LT	12	LT
Chloroethane	8	LT	8	LT	8	LT
Methylene Chloride	1	LT	1	LT	1	LT
1,1-Dichloroethene	1	LT	1	LT	1	LT
1,1-Dichloroethane	1	LT	1	LT	1	LT
1,2-Dichloroethylenes	5	LT	5	LT	5	LT
Chloroform	1.6		1.1		1	
1,2-Dichloroethane	1	LT	1	LT	1	LT
1,1,1-Trichloroethane	1	LT	1	LT	1	LT
Carbon Tetrachloride	1.5		1	LT	1	LT
Bromodichloromethane	1	LT	1	LT	1	LT
1,2-Dichloropropane	1	LT	6.5		6	
Trichloroethene	1	LT	1	LT	1	LT
1,3-Dichloropropane	4.8	LT	4.8	LT	4.8	LT
Dibromochloromethane	1	LT	1	LT	1	LT
1,1,2-Trichloroethane	1	LT	1	LT	1	LT
2-Chloroethylvinyl Ether	3.5	LT	3.5	LT	3.5	LT
Bromoform	11	LT	11	LT	11	LT
1,1,2,2-Tetrachloroethane	1.5	LT	1.5	LT	1.5	LT
Tetrachloroethene	4.9		1	LT	2.2	
Carbon Disulfide	5	ND	5	ND	5	ND
Cis-1,3-Dichloropropene	5	ND	5	ND	5	ND
Trans-1,3-Dichloropropene	5	ND	5	ND	5	ND
WATER SOLUBLE						
Acetone	8	LT	8	LT	8	LT
2-Butanone	10	LT	10	LT	10	LT
4-Methyl-2-Pentanone	1.4	LT	1.4	LT	1.4	LT
2-Hexanone	1	ND	1	ND	1	ND
OTHER						
Acrylonitrile	8.4	LT	8.4	LT	8.4	LT
Trichlorofluoromethane	1	LT	1	LT	1	LT
Vinyl Acetate	1	ND	1	ND	1	ND
TOTAL VOCs	8		8		9	
Collection Date:	18-Mar-93		22-Feb-93		23-Feb-93	
Extraction Date:	01-Apr-93		06-Mar-93		06-Mar-93	
Analysis Date:	01-Apr-93		06-Mar-93		06-Mar-93	

NOTES:
(1) LT= Less than detection limits; ND= Not detected, GT = Greater than detection limit
(2) Depth based on total depth measurements assuming a 10-ft screen and a 2.5-ft stickup (no well log available)

TABLE DSY-4: Semivolatile Organic Compounds in Ground Water from the DSY

Fort George G. Meade, Maryland

Sample Location Identification	COE-1	MW-42	93QC-452	MW-43D	MW-43S	MW-200	MW-201
Field Sample ID	D1M001Y	D1M042Y	Q1X0452Y	D1M043DY	D1M043SY	D1M0200Y	D1M0201Y
Site Type	WELL	WELL	WELL	WELL	WELL	WELL	WELL
Screen Start Depth (ft bgs)	24.5(2)	35(2)	35	82(2)	30(2)	47	26
Screen End Depth (ft bgs)	25.5(2)	45(2)	45	92(2)	40(2)	57	36
Media	CGW	CGW	CGW	CGW	CGW	CGW	CGW
Total/Dissolved	Total	Total	Total	Total	Total	Total	Total
QC Type			Dup. of MW-42				
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)							
CHLORINATED MONOCYCLIC AROMATICS							
1,3-Dichlorobenzene	3.4 LT	3.4 LT	3.4 LT	3.4 LT	3.4 LT	3.4 LT	3.4 LT
1,4-Dichlorobenzene	1.5 LT	1.5 LT	1.5 LT	1.5 LT	1.5 LT	1.5 LT	1.5 LT
1,2-Dichlorobenzene	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT
1,2,4-Trichlorobenzene	2.4 LT	2.4 LT	2.4 LT	2.4 LT	2.4 LT	2.4 LT	2.4 LT
1,2,3-Trichlorobenzene	5.8 LT	5.8 LT	5.8 LT	5.8 LT	5.8 LT	5.8 LT	5.8 LT
Hexachlorobenzene	12 LT	12 LT	12 LT	12 LT	12 LT	12 LT	12 LT
NITROSAMINES							
N-Nitroso Dimethylamine	9.7 LT	9.7 LT	9.7 LT	9.7 LT	9.7 LT	9.7 LT	9.7 LT
N-Nitroso Di-N-Propylamine	6.8 LT	6.8 LT	6.8 LT	6.8 LT	6.8 LT	6.8 LT	6.8 LT
N-Nitroso Diphenylamine	3.7 LT	3.7 LT	3.7 LT	3.7 LT	3.7 LT	3.7 LT	3.7 LT
NITROMONOCYCLIC AROMATICS							
Nitrobenzene	3.7 LT	3.7 LT	3.7 LT	3.7 LT	3.7 LT	3.7 LT	3.7 LT
3-Nitrotoluene	2.9 LT	2.9 LT	2.9 LT	2.9 LT	2.9 LT	2.9 LT	2.9 LT
2,6-Dinitrotoluene	6.7 LT	6.7 LT	6.7 LT	6.7 LT	6.7 LT	6.7 LT	6.7 LT
2,4-Dinitrotoluene	5.8 LT	5.8 LT	5.8 LT	5.8 LT	5.8 LT	5.8 LT	5.8 LT
PHOSPHORUS CONTAINING							
Dimethylmethyl Phosphate	130 LT	130 LT	130 LT	130 LT	130 LT	130 LT	130 LT
Diisopropylmethyl Phosphonate	21 LT	21 LT	21 LT	21 LT	21 LT	21 LT	21 LT
PCBs							
PCB 1016	9.1 ND	9.1 ND	9.1 ND	9.1 ND	9.1 ND	9.1 ND	9.1 ND
PCB 1221	7.2 ND	7.2 ND	7.2 ND	7.2 ND	7.2 ND	7.2 ND	7.2 ND
PCB 1232	9.9 ND	9.9 ND	9.9 ND	9.9 ND	9.9 ND	9.9 ND	9.9 ND
PCB 1242	5.2 ND	5.2 ND	5.2 ND	5.2 ND	5.2 ND	5.2 ND	5.2 ND
PCB 1248	38 ND	38 ND	38 ND	38 ND	38 ND	38 ND	38 ND
PCB 1254	33 ND	33 ND	33 ND	33 ND	33 ND	33 ND	33 ND
PCB 1260	13 ND	13 ND	13 ND	13 ND	13 ND	13 ND	13 ND
PHENOLS							
Phenol	2.2 LT	2.2 LT	2.2 LT	2.2 LT	2.2 LT	2.2 LT	2.2 LT
4-Methylphenol	2.8 LT	2.8 LT	2.8 LT	2.8 LT	2.8 LT	2.8 LT	2.8 LT
2-Chlorophenol	2.8 LT	2.8 LT	2.8 LT	2.8 LT	2.8 LT	2.8 LT	2.8 LT
2-Methylphenol	3.6 LT	3.6 LT	3.6 LT	3.6 LT	3.6 LT	3.6 LT	3.6 LT
2-Nitrophenol	8.2 LT	8.2 LT	8.2 LT	8.2 LT	8.2 LT	8.2 LT	8.2 LT
2,4-Dimethylphenol	4.4 LT	4.4 LT	4.4 LT	4.4 LT	4.4 LT	4.4 LT	4.4 LT
2,4-Dichlorophenol	8.4 LT	8.4 LT	8.4 LT	8.4 LT	8.4 LT	8.4 LT	8.4 LT
3-Methyl-4-Chlorophenol	8.5 LT	8.5 LT	8.5 LT	8.5 LT	8.5 LT	8.5 LT	8.5 LT
2,4,6-Trichlorophenol	3.6 LT	3.6 LT	3.6 LT	3.6 LT	3.6 LT	3.6 LT	3.6 LT
2,4,5-Trichlorophenol	2.8 LT	2.8 LT	2.8 LT	2.8 LT	2.8 LT	2.8 LT	2.8 LT
2,3,6-Trichlorophenol	1.7 LT	1.7 LT	1.7 LT	1.7 LT	1.7 LT	1.7 LT	1.7 LT
2,4-Dinitrophenol	180 LT	180 LT	180 LT	180 LT	180 LT	180 LT	180 LT
4-Nitrophenol	96 LT	96 LT	96 LT	96 LT	96 LT	96 LT	96 LT
Methyl-4,6-Dinitrophenol	50 ND	50 ND	50 ND	50 ND	50 ND	50 ND	50 ND
Pentachlorophenol	9.1 LT	9.1 LT	9.1 LT	9.1 LT	9.1 LT	9.1 LT	9.1 LT
POLYNUCLEAR AROMATICS							
Naphthalene	0.5 LT	0.5 LT	0.5 LT	0.5 LT	0.5 LT	0.5 LT	0.5 LT
2-Methylnaphthalene	1.3 LT	1.3 LT	1.3 LT	1.3 LT	1.3 LT	1.3 LT	1.3 LT
2-Chloronaphthalene	2.6 LT	2.6 LT	2.6 LT	2.6 LT	2.6 LT	2.6 LT	2.6 LT
Acenaphthene	5.8 LT	5.8 LT	5.8 LT	5.8 LT	5.8 LT	5.8 LT	5.8 LT
Fluorene	9.2 LT	9.2 LT	9.2 LT	9.2 LT	9.2 LT	9.2 LT	9.2 LT
Phenanthrene	9.9 LT	9.9 LT	9.9 LT	9.9 LT	9.9 LT	9.9 LT	9.9 LT
Anthracene	5.2 LT	5.2 LT	5.2 LT	5.2 LT	5.2 LT	5.2 LT	5.2 LT
Pyrene	17 LT	17 LT	17 LT	17 LT	17 LT	17 LT	17 LT
Fluoranthene	24 LT	24 LT	24 LT	24 LT	24 LT	24 LT	24 LT
Benzo [A] Anthracene	9.8 ND	9.8 ND	9.8 ND	9.8 ND	9.8 ND	9.8 ND	9.8 LT
Chrysene	7.4 LT	7.4 LT	7.4 LT	7.4 LT	7.4 LT	7.4 LT	7.4 LT
Benzo [B] Fluoranthene	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT
Benzo [K] Fluoranthene	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT
Benzo [A] Pyrene	14 LT	14 LT	14 LT	14 LT	14 LT	14 LT	14 LT
Indeno [1,2,3-C,D] Pyrene	21 LT	21 LT	21 LT	21 LT	21 LT	21 LT	21 LT
Dibenz [A,H] Anthracene	12 LT	12 LT	12 LT	12 LT	12 LT	12 LT	12 LT
Benzo [G,H,I] Perylene	15 LT	15 LT	15 LT	15 LT	15 LT	15 LT	15 LT

TABLE DSY-4: Semivolatile Organic Compounds in Ground Water from the DSY

Fort George G. Meade, Maryland

Sample Location Identification	COE-1	MW-42	93QC-452	MW-43D	MW-43S	MW-200	MW-201
Field Sample ID	D1M001Y	D1M042Y	Q1X0452Y	D1M043DY	D1M043SY	D1M0200Y	D1M0201Y
Site Type	WELL	WELL	WELL	WELL	WELL	WELL	WELL
Screen Start Depth (ft bgs)	24.5(2)	35(2)	35	82(2)	30(2)	47	26
Screen End Depth (ft bgs)	25.5(2)	45(2)	45	92(2)	40(2)	57	36
Media	CGW	CGW	CGW	CGW	CGW	CGW	CGW
Total/Dissolved	Total	Total	Total	Total	Total	Total	Total
QC Type			Dup. of MW-42				
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)							
PESTICIDES							
Beta-Hexachlorocyclohexane	17 LT	17 LT	17 LT	17 LT	17 LT	17 LT	17 LT
Alpha-Hexachlorocyclohexane	5.3 LT	5.3 LT	5.3 LT	5.3 LT	5.3 LT	5.3 LT	5.3 LT
Atrazine	5.9 LT	5.9 LT	5.9 LT	5.9 LT	5.9 LT	5.9 LT	5.9 LT
Lindane	7.2 LT	7.2 LT	7.2 LT	7.2 LT	7.2 LT	7.2 LT	7.2 LT
Delta-Hexachlorocyclohexane	3 ND	3 ND	3 ND	3 ND	3 ND	3 ND	3 ND
Heptachlor	38 LT	38 LT	38 LT	38 LT	38 LT	38 LT	38 LT
Bromacil	2.9 LT	2.9 LT	2.9 LT	2.9 LT	4.4	2.9 LT	8
Malathion	21 LT	21 LT	21 LT	21 LT	21 LT	21 LT	21 LT
2,2-Bis (Para-Chlorophenyl)-1,1,1-Trichloroethane	18 LT	18 LT	18 LT	18 LT	18 LT	18 LT	18 LT
Parathion	37 LT	37 LT	37 LT	37 LT	37 LT	37 LT	37 LT
Aldrin	13 LT	13 LT	13 LT	13 LT	13 LT	13 LT	13 LT
Supona	19 LT	19 LT	19 LT	19 LT	19 LT	19 LT	19 LT
Isodrin	7.8 LT	7.8 LT	7.8 LT	7.8 LT	7.8 LT	7.8 LT	7.8 LT
Heptachlor Epoxide	28 LT	28 LT	28 LT	28 LT	28 LT	28 LT	28 LT
Vapona	8.5 LT	8.5 LT	8.5 LT	8.5 LT	8.5 LT	8.5 LT	8.5 LT
Chlordane	37 ND	37 ND	37 ND	37 ND	37 ND	37 ND	37 ND
Alpha-Endosulfan / Endosulfan I	23 LT	23 LT	23 LT	23 LT	23 LT	23 LT	23 LT
2,2-Bis (Para-Chlorophenyl)-1,1-Dichloroethene	14 LT	14 LT	14 LT	14 LT	14 LT	14 LT	14 LT
Dieldrin	26 LT	26 LT	26 LT	26 LT	26 LT	26 LT	26 LT
Endrin Aldehyde	5 LT	5 LT	5 LT	5 LT	5 LT	5 LT	5 LT
Endrin	18 LT	18 LT	18 LT	18 LT	18 LT	18 LT	18 LT
2,2-Bis (Para-Chlorophenyl)-1,1-Dichloroethane	18 LT	18 LT	18 LT	18 LT	18 LT	18 LT	18 LT
Beta-Endosulfan / Endosulfan II	42 LT	42 LT	42 LT	42 LT	42 LT	42 LT	42 LT
Endosulfan Sulfate	50 LT	50 LT	50 LT	50 LT	50 LT	50 LT	50 LT
Methoxychlor	11 LT	11 LT	11 LT	11 LT	11 LT	11 LT	11 LT
Mirex	24 LT	24 LT	24 LT	24 LT	24 LT	24 LT	24 LT
Endrin Ketone	6 ND	6 ND	6 ND	6 ND	6 ND	6 ND	6 ND
Toxaphene	17 ND	17 ND	17 ND	17 ND	17 ND	17 ND	17 ND
PHTHALATES							
Dimethyl Phthalate	2.2 LT	2.2 LT	2.2 LT	2.2 LT	2.2 LT	2.2 LT	2.2 LT
Diethyl Phthalate	5.9 LT	5.9 LT	5.9 LT	5.9 LT	5.9 LT	5.9 LT	5.9 LT
Di-N-Butyl Phthalate	33 LT	33 LT	33 LT	33 LT	33 LT	33 LT	33 LT
Butylbenzyl Phthalate	28 LT	28 LT	28 LT	28 LT	28 LT	28 LT	28 LT
Bis (2-Ethylhexyl) Phthalate	7.7 LT	7.7 LT	7.7 LT	7.7 LT	7.7 LT	7.7 LT	7.7 LT
Di-N-Octyl Phthalate	1.5 LT	1.5 LT	1.5 LT	1.5 LT	1.5 LT	1.5 LT	1.5 LT
SULFUR CONTAINING ORGANICS							
4-Chlorophenylmethyl Sulfoxide	15 LT	15 LT	15 LT	15 LT	15 LT	15 LT	15 LT
4-Chlorophenylmethyl Sulfide	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT
4-Chlorophenylmethyl Sulfone	5.3 LT	5.3 LT	5.3 LT	5.3 LT	5.3 LT	5.3 LT	5.3 LT
OTHER							
1,4-Oxathiane	27 LT	27 LT	27 LT	27 LT	27 LT	27 LT	27 LT
Bis (2-Chloroisopropyl) Ether	5 LT	5 LT	5 LT	5 LT	5 LT	5 LT	5 LT
Bis (2-Chloroethyl) Ether	0.68 LT	0.68 LT	0.68 LT	0.68 LT	0.68 LT	0.68 LT	0.68 LT
Dicyclopentadiene	5.5 LT	5.5 LT	5.5 LT	5.5 LT	5.5 LT	5.5 LT	5.5 LT
Benzyl Alcohol	4 LT	4 LT	4 LT	4 LT	4 LT	4 LT	4 LT
Dithiane	3.3 LT	3.3 LT	3.3 LT	3.3 LT	3.3 LT	3.3 LT	3.3 LT
Hexachloroethane	8.3 LT	8.3 LT	8.3 LT	8.3 LT	8.3 LT	8.3 LT	8.3 LT
Dibromochloropropane	12 LT	12 LT	12 LT	12 LT	12 LT	12 LT	12 LT
Isophorone	2.4 LT	2.4 LT	2.4 LT	2.4 LT	2.4 LT	2.4 LT	2.4 LT
Bis (2-Chloroethoxy) Methane	6.8 LT	6.8 LT	6.8 LT	6.8 LT	6.8 LT	6.8 LT	6.8 LT
Benzoic Acid	3.1 ND	3.1 ND	3.1 ND	3.1 ND	3.1 ND	3.1 ND	3.1 ND
4-Chloroaniline	1 ND	1 ND	1 ND	1 ND	1 ND	1 ND	1 ND
Hexachlorocyclopentadiene	54 LT	54 LT	54 LT	54 LT	54 LT	54 LT	54 LT
2-Nitroaniline	31 ND	31 ND	31 ND	31 ND	31 ND	31 ND	31 ND
3-Nitroaniline	15 LT	15 LT	15 LT	15 LT	15 LT	15 LT	15 LT
Dibenzofuran	5.1 LT	5.1 LT	5.1 LT	5.1 LT	5.1 LT	5.1 LT	5.1 LT
4-Chlorophenylphenyl Ether	23 LT	23 LT	23 LT	23 LT	23 LT	23 LT	23 LT
4-Nitroaniline	31 ND	31 ND	31 ND	31 ND	31 ND	31 ND	31 ND
1,2-Diphenylhydrazine	13 LT	13 LT	13 LT	13 LT	13 LT	13 LT	13 LT
2,6-Dinitroaniline	8.8 LT	8.8 LT	8.8 LT	8.8 LT	8.8 LT	8.8 LT	8.8 LT
4-Bromophenylphenyl Ether	22 LT	22 LT	22 LT	22 LT	22 LT	22 LT	22 LT
3,5-Dinitroaniline	21 LT	21 LT	21 LT	21 LT	21 LT	21 LT	21 LT
Hexachlorobutadiene	8.7 LT	8.7 LT	8.7 LT	8.7 LT	8.7 LT	8.7 LT	8.7 LT
3,3'-Dichlorobenzidine	5 LT	5 LT	5 LT	5 LT	5 LT	5 LT	5 LT
TOTAL SVOC	0	0	0	0	4	0	8
Collection Date:	23-Feb-93	23-Feb-93	23-Feb-93	24-Feb-93	24-Feb-93	23-Feb-93	18-Mar-93
Extraction Date:	27-Mar-93	02-Mar-93	02-Mar-93	02-Mar-93	25-Mar-93	27-Feb-93	25-Mar-93
Analysis Date:	12-Mar-93	18-Mar-93	18-Mar-93	18-Mar-93	08-Apr-93	12-Mar-93	08-Apr-93

NOTES:
(1) += Depth based on total depth measurements assuming a 10-ft screen and a 2-ft stickup (no well log available)
(2) LT= Less than detection limits; ND= Not detected

TABLE DSY-4: Semivolatile Organic Compounds in Ground Water from the DSY
Fort George G. Meade, Maryland

Sample Location Identification	93QC-153		93QC-253	
Field Sample ID	Q1XF153Y		Q1XF253Y	
Site Type	FBLK		FBLK	
Screen Start Depth (ft bgs)	-		-	
Screen End Depth (ft bgs)	-		-	
Media	CSW		CSW	
Total/Dissolved	Total		Total	
QC Type	Field Blank		Rinse Water	
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)				
CHLORINATED MONOCYCLIC AROMATICS				
1,3-Dichlorobenzene	3.4	LT	3.4	LT
1,4-Dichlorobenzene	1.5	LT	1.5	LT
1,2-Dichlorobenzene	1.2	LT	1.2	LT
1,2,4-Trichlorobenzene	2.4	LT	2.4	LT
1,2,3-Trichlorobenzene	5.8	LT	5.8	LT
Hexachlorobenzene	12	LT	12	LT
NITROSAMINES				
N-Nitroso Dimethylamine	9.7	LT	9.7	LT
N-Nitroso Di-N-Propylamine	6.8	LT	6.8	LT
N-Nitroso Diphenylamine	3.7	LT	3.7	LT
NITROMONOCYCLIC AROMATICS				
Nitrobenzene	3.7	LT	3.7	LT
3-Nitrotoluene	2.9	LT	2.9	LT
2,6-Dinitrotoluene	6.7	LT	6.7	LT
2,4-Dinitrotoluene	5.8	LT	5.8	LT
PHOSPHORUS CONTAINING				
Dimethylmethyl Phosphate	130	LT	130	LT
Diisopropylmethyl Phosphonate	21	LT	21	LT
PCBs				
PCB 1016	9.1	ND	9.1	ND
PCB 1221	7.2	ND	7.2	ND
PCB 1232	9.9	ND	9.9	ND
PCB 1242	5.2	ND	5.2	ND
PCB 1248	38	ND	38	ND
PCB 1254	33	ND	33	ND
PCB 1260	13	ND	13	ND
PHENOLS				
Phenol	2.2	LT	2.2	LT
4-Methylphenol	2.8	LT	2.8	LT
2-Chlorophenol	2.8	LT	2.8	LT
2-Methylphenol	3.6	LT	3.6	LT
2-Nitrophenol	8.2	LT	8.2	LT
2,4-Dimethylphenol	4.4	LT	4.4	LT
2,4-Dichlorophenol	8.4	LT	8.4	LT
3-Methyl-4-Chlorophenol	8.5	LT	8.5	LT
2,4,6-Trichlorophenol	3.6	LT	3.6	LT
2,4,5-Trichlorophenol	2.8	LT	2.8	LT
2,3,6-Trichlorophenol	1.7	LT	1.7	LT
2,4-Dinitrophenol	180	LT	180	LT
4-Nitrophenol	96	LT	96	LT
Methyl-4,6-Dinitrophenol	50	ND	50	ND
Pentachlorophenol	9.1	LT	9.1	LT
POLYNUCLEAR AROMATICS				
Naphthalene	0.5	LT	0.5	LT
2-Methylnaphthalene	1.3	LT	1.3	LT
2-Chloronaphthalene	2.6	LT	2.6	LT
Acenaphthene	5.8	LT	5.8	LT
Fluorene	9.2	LT	9.2	LT
Phenanthrene	9.9	LT	9.9	LT
Anthracene	5.2	LT	5.2	LT
Pyrene	17	LT	17	LT
Fluoranthene	24	LT	24	LT
Benzo [A] Anthracene	9.8	ND	9.8	ND
Chrysene	7.4	LT	7.4	LT
Benzo [B] Fluoranthene	10	LT	10	LT
Benzo [K] Fluoranthene	10	LT	10	LT
Benzo [A] Pyrene	14	LT	14	LT
Indeno [1,2,3-C,D] Pyrene	21	LT	21	LT
Dibenz [A,H] Anthracene	12	LT	12	LT
Benzo [G,H,I] Perylene	15	LT	15	LT

TABLE DSY-4: Semivolatile Organic Compounds in Ground Water from the DSY
Fort George G. Meade, Maryland

Sample Location Identification	93QC-153		93QC-253	
Field Sample ID	Q1XF153Y		Q1XF253Y	
Site Type	FBLK		FBLK	
Screen Start Depth (ft bgs)	-		-	
Screen End Depth (ft bgs)	-		-	
Media	CSW		CSW	
Total/Dissolved	Total		Total	
QC Type	Field Blank		Rinse Water	
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)				
PESTICIDES				
Beta-Hexachlorocyclohexane	17	LT	17	LT
Alpha-Hexachlorocyclohexane	5.3	LT	5.3	LT
Atrazine	5.9	LT	5.9	LT
Lindane	7.2	LT	7.2	LT
Delta-Hexachlorocyclohexane	3	ND	3	ND
Heptachlor	38	LT	38	LT
Bromacil	2.9	LT	2.9	LT
Malathion	21	LT	21	LT
2,2-Bis (Para-Chlorophenyl)-1,1,1-Trichloroethane	14	LT	14	LT
Parathion	37	LT	37	LT
Aldrin	13	LT	13	LT
Supona	19	LT	19	LT
Isodrin	7.8	LT	7.8	LT
Heptachlor Epoxide	28	LT	28	LT
Vapona	8.5	LT	8.5	LT
Chlordane	37	ND	37	ND
Alpha-Endosulfan / Endosulfan I	23	LT	23	LT
2,2-Bis (Para-Chlorophenyl)-1,1-Dichloroethene	18	LT	18	LT
Dieldrin	26	LT	26	LT
Endrin Aldehyde	5	LT	5	LT
Endrin	18	LT	18	LT
2,2-Bis (Para-Chlorophenyl)-1,1-Dichloroethane	18	LT	18	LT
Beta-Endosulfan / Endosulfan II	42	LT	42	LT
Endosulfan Sulfate	50	LT	50	LT
Methoxychlor	11	LT	11	LT
Mirex	24	LT	24	LT
Endrin Ketone	6	ND	6	ND
Toxaphene	17	ND	17	ND
PHTHALATES				
Dimethyl Phthalate	2.2	LT	2.2	LT
Diethyl Phthalate	5.9	LT	5.9	LT
Di-N-Butyl Phthalate	33	LT	33	LT
Butylbenzyl Phthalate	28	LT	28	LT
Bis (2-Ethylhexyl) Phthalate	7.7	LT	7.7	LT
Di-N-Octyl Phthalate	1.5	LT	1.5	LT
SULFUR CONTAINING ORGANICS				
4-Chlorophenylmethyl Sulfoxide	10	LT	10	LT
4-Chlorophenylmethyl Sulfide	15	LT	15	LT
4-Chlorophenylmethyl Sulfone	5.3	LT	5.3	LT
OTHER				
1,4-Oxathiane	27	LT	27	LT
Bis (2-Chloroisopropyl) Ether	5	LT	5	LT
Bis (2-Chloroethyl) Ether	0.68	LT	0.68	LT
Dicyclopentadiene	5.5	LT	5.5	LT
Benzyl Alcohol	4	LT	4	LT
Dithiane	3.3	LT	3.3	LT
Hexachloroethane	8.3	LT	8.3	LT
Dibromochloropropane	12	LT	12	LT
Isophorone	2.4	LT	2.4	LT
Bis (2-Chloroethoxy) Methane	6.8	LT	6.8	LT
Benzoic Acid	3.1	ND	3.1	ND
4-Chloroaniline	1	ND	1	ND
Hexachlorocyclopentadiene	54	LT	54	LT
2-Nitroaniline	31	ND	31	ND
3-Nitroaniline	15	LT	15	LT
Dibenzofuran	5.1	LT	5.1	LT
4-Chlorophenylphenyl Ether	23	LT	23	LT
4-Nitroaniline	31	ND	31	ND
1,2-Diphenylhydrazine	13	LT	13	LT
2,6-Dinitroaniline	8.8	LT	8.8	LT
4-Bromophenylphenyl Ether	22	LT	22	LT
3,5-Dinitroaniline	21	LT	21	LT
Hexachlorobutadiene	8.7	LT	8.7	LT
3,3'-Dichlorobenzidine	5	LT	5	LT
TOTAL SVOC	0		0	
Collection Date:	23-Feb-93		23-Feb-93	
Extraction Date:	12-Mar-93		12-Mar-93	
Analysis Date:	21-Mar-93		21-Mar-93	

NOTES:
(1) += Depth based on total depth measurements assuming a 10-ft screen and a 2-ft stickup (no well log available)
(2) LT= Less than detection limits; ND= Not detected

Appendix I: Fire Training Area Analytical Results

Table FTA-1: Field Screening, Metals and Petroleum Hydrocarbon Data for Ground Water from the FTA

Table FTA-2: Volatile Organic Compounds in Ground Water from the FTA

Table FTA-3: Semivolatile Organic Compounds in Ground Water from the FTA

Table FTA-4: Volatile Organic Compounds and Petroleum Hydrocarbons Data for Fort George G. Meade, Maryland

Table FTA-5: Semivolatile Organic Compounds in Sediment from the Fire Training Area

Note: The term "LT" indicates that a certified analyte is not detected. The term "ND" is used for analytes that are added to certified methods but have not gone through the certification process. The term "LT" is followed by the certified reporting limit, it does not signify that a compound was actually detected but not included because results were below the Contract Required Detection Limit.

TABLE FTA-1: Field Screening, Metals and Petroleum Hydrocarbon Data for Ground Water from the FTA
Fort George G. Meade, Maryland
Page 1 of 2

Sample Location Identification	FTAMW-1	FTAMW-1	FTAMW-2	FTAMW-2	FTAMW-3	FTAMW-3
Field Sample ID	F1M0001Y	F1M0001Z	F1M0002Y	F1M0002Z	F1M0003Y	F1M0003Z
Site Type	WELL	WELL	WELL	WELL	WELL	WELL
Screen Start Depth (ft bgs)	3.5	3.5	3.6	3.6	3.6	3.6
Screen End Depth (ft bgs)	13.5	13.5	13.6	13.6	13.6	13.6
Media	CGW	CGW	CGW	CGW	CGW	CGW
Total/Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
QC Type						
FIELD PARAMETERS						
pH	7.43		5.59		5.06	
Conductivity (umhos/cm2)	0.127		0.1		0.111	
Temperature (C)	7.3		8.8		6.3	
Turbidity (NTU)	8		140		>999	
METALS (ug/L)						
Aluminum	1320	112 LT	7460	112 LT	23700	112 LT
Antimony	60 LT	60 LT	60 LT	60 LT	61.5	60 LT
Arsenic	2.35 LT	2.35 LT	2.35 LT	2.35 LT	5.82	2.35 LT
Barium	44.5	24.6	65.6	18.7	178	46.9
Beryllium	1.12 LT	1.12 LT	1.12 LT	1.12 LT	2.35	1.12 LT
Boron	230 LT	230 LT	230 LT	230 LT	230 LT	230 LT
Cadmium	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT
Calcium	14200	13800	14600	12400	14100	12800
Chromium	16.8 LT	16.8 LT	23.1	16.8 LT	57.9	16.8 LT
Cobalt	25 LT	25 LT	25 LT	28.8	37	31.9
Copper	18.8 LT	18.8 LT	18.8 LT	18.8 LT	31.3	18.8 LT
Iron	2820	77.5 LT	15200	77.5 LT	44400	115
Lead	4.47 LT	4.47 LT	10.2	4.47 LT	24.4	4.47 LT
Magnesium	4290	3750	3810	1960	8060	3460
Manganese	94.7	67.5	155	35.9	637	327
Mercury	0.1 LT	0.1 LT	0.1 LT	0.1 LT	0.1	0.1 LT
Molybdenum	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT
Nickel	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT
Potassium	1740	1780	3570	2740	5130	1710
Selenium	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT
Silver	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT
Sodium	2380	2320	3150	2820	2920	2980
Tellurium	118 LT	118 LT	118 LT	118 LT	118 LT	118 LT
Thallium	125 LT	125 LT	125 LT	125 LT	125 LT	125 LT
Tin	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT
Vanadium	27.6 LT	27.6 LT	27.6 LT	27.6 LT	101	27.6 LT
Zinc	18 LT	18 LT	34.8	18 LT	76.2	18 LT
HEAVY METALS(1)	**0**	**0**	**33.3**	**0**	**10509.4**	**0**
GRAND TOTAL METALS	**26889**	**21742**	**48079**	**20003**	**99523**	**21471**
TOTAL PETROLEUM HYDROCARBONS						
Diesel Fuel (mg/L)	0.1 LT	NA	0.1 LT	NA	0.1 LT	NA
Collection Date:	18-Feb-93	18-Feb-93	18-Feb-93	18-Feb-93	18-Feb-93	18-Feb-93

NOTES:
(1) = Heavy metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag; LT= Less than detection limits; ND= Not detected
J = Value is estimated
(2) NA = Not Analyzed

TABLE FTA-1: Field Screening, Metals and Petroleum Hydrocarbon Data for Ground Water from the FTA Fort George G. Meade, Maryland

Sample Location Identification	93QC-152		93QC-252	
Field Sample ID	Q1XF152Y		Q1XF152Y	
Site Type	FBLK		RNSW	
Screen Start Depth (ft bgs)	-		-	
Screen End Depth (ft bgs)	-		-	
Media	CSW		CSW	
Total/Dissolved	Total		Total	
QC Type	Field Blank		Rinse Water	
FIELD PARAMETERS				
pH				
Conductivity (umhos/cm2)				
Temperature (C)				
Turbidity (NTU)				
METALS (ug/L)				
Aluminum	112	LT	112	LT
Antimony	60	LT	60	LT
Arsenic	2.35	LT	2.35	LT
Barium	2.82	LT(J)	2.82	LT
Beryllium	1.12	LT	1.12	LT
Boron	230	LT	230	LT
Cadmium	6.78	LT	6.78	LT
Calcium	105	LT	105	LT
Chromium	16.8	LT	16.8	LT
Cobalt	25	LT	25	LT
Copper	18.8	LT	18.8	LT
Iron	77.5	LT	77.5	LT
Lead	4.47	LT	4.47	LT
Magnesium	135	LT	135	LT
Manganese	9.67	LT	9.67	LT
Mercury	0.1	LT	0.1	LT
Molybdenum	52.7	LT	52.7	LT
Nickel	32.1	LT	32.1	LT
Potassium	1240	LT	1240	LT
Selenium	2.53	LT	2.53	LT
Silver	10	LT	10	LT
Sodium	279	LT	279	LT
Tellurium	118	LT	118	LT
Thallium	125	LT	125	LT
Tin	59.9	LT	59.9	LT
Vanadium	27.6	LT	27.6	LT
Zinc	18	LT	18	LT
HEAVY METALS(1)	**0**		**0**	
GRAND TOTAL METALS	**0**		**0**	
TOTAL PETROLEUM HYDROCARBONS				
Diesel Fuel (mg/L)	NA		NA	
Collection Date:	18-Feb-93		18-Feb-93	

NOTES:
(1) = Heavy metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag; LT= Less than detection limits; ND= Not detected
J = Value is estimated
(2) NA = Not Analyzed

TABLE FTA-2: Volatile Organic Compounds in Ground Water from the FTA
Fort George G. Meade, Maryland

Sample Location Identification	FTAMW-1	FTAMW-2	FTAMW-3	93QC-152	93QC-252
Field Sample ID	F1M0001Y	F1M0002Y	F1M0003Y	Q1XF152Y	Q1XR252Y
Site Type	WELL	WELL	WELL	FBLK	RNSW
Screen Start Depth (ft bags)	3.5	3.6	3.6	-	-
Screen End Depth (ft bags)	13.5	13.6	13.6	-	-
Media	CGW	CGW	CGW	CSW	CSW
QC Type				Field Blank	Rinse Water
VOLATILE ORGANIC COMPOUNDS (ug/L)					
AROMATICS					
Benzene	1 LT	1 LT	1 LT	1 LT	1 LT
Toluene	1 LT	1 LT	1 LT	1 LT	1 LT
Ethylbenzene	1 LT	1 LT	1 LT	1 LT	1 LT
Xylenes	2 LT	2 LT	2 LT	2 LT	2 LT
1,3-Dichlorobenzene	1 LT	1 LT	1 LT	1 LT	1 LT
Styrene	5 ND	5 ND	5 ND	5 N	5 ND
CHLORINATED AROMATICS					
Chlorobenzene	1 LT	1 LT	1 LT	1 LT	1 LT
1,3-Dimethylbenzene / M-Xylene	1 LT	1 LT	1 LT	1 LT	1 LT
Dichlorobenzene, Nonspecific	2 LT	2 LT	2 LT	2 LT	2 LT
HALOGENATED ORGANICS					
Chloromethane	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT
Bromomethane	14 LT	14 LT	14 LT	14 LT	14 LT
Chloroethene / Vinyl Chloride	12 LT	12 LT	12 LT	12 LT	12 LT
Chloroethane	8 LT	8 LT	8 LT	8 LT	8 LT
Methylene Chloride	1 LT	1 LT	1 LT	1 LT	1 LT
1,1-Dichloroethylene / 1,1-Dichloroethene	1 LT	1 LT	1 LT	1 LT	1 LT
1,1-Dichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT
1,2-Dichloroethylenes (Cis And Trans Isomers)	5 LT	5 LT	5 LT	5 LT	5 LT
Chloroform	1 LT	1 LT	1 LT	1 LT	1 LT
1,2-Dichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT
1,1,1-Trichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT
Carbon Tetrachloride	1 LT	1 LT	35	1 LT	1 LT
Bromodichloromethane	1 LT	1 LT	1 LT	1 LT	1 LT
1,2-Dichloropropane	1 LT	1 LT	1 LT	1 LT	5.1
Trichloroethylene / Trichloroethene	1 LT	1 LT	1 LT	1 LT	1 LT
1,3-Dichloropropane	4.8 LT	4.8 LT	4.8 LT	4.8 LT	4.8 LT
Dibromochloromethane	1 LT	1 LT	1 LT	1 LT	1 LT
1,1,2-Trichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT
2-Chloroethylvinyl Ether / (2-Chloroethoxy) Ethene	3.5 LT	3.5 LT	3.5 LT	3.5 LT	3.5 LT
Bromoform	11 LT	11 LT	11 LT	11 LT	11 LT
1,1,2,2-Tetrachloroethane	1.5 LT	1.5 LT	1.5 LT	1.5 LT	1.5 LT
Tetrachloroethylene / Tetrachloroethene	1 LT	1 LT	1 LT	1 LT	1 LT
Carbon Disulfide	5 ND	5 ND	5 ND	5 N	5 ND
Cis-1,3-Dichloropropylene / Cis-1,3-Dichloropropene	5 ND	5 ND	5 ND	5 N	5 ND
Trans-1,3-Dichloropropene	5 ND	5 ND	5 ND	5 N	5 ND
WATER SOLUBLE					
Acetone	8 LT	8 LT	8 LT	8 LT	8 LT
Methylethyl Ketone / 2-Butanone	10 LT	10 LT	10 LT	10 LT	10 LT
Methylisobutyl Ketone/4-Methyl-2-Pentanone	1.4 LT	1.4 LT	1.4 LT	1.4 LT	1.4 LT
Methyl-N-Butyl Ketone / 2-Hexanone	1 ND	1 ND	1 ND	1 N	1 ND
OTHER					
Acrylonitrile	8.4 LT	8.4 LT	8.4 LT	8.4 LT	8.4 LT
Trichlorofluoromethane	1 LT	1 LT	1 LT	1 LT	1 LT
Acetic Acid, Vinyl Ester / Vinyl Acetate	1 ND	1 ND	1 ND	1 N	1 ND
TOTAL VOCs	**0**	**0**	**35**	**0**	**5**
Collection Date:	18-Feb-93	18-Feb-93	18-Feb-93	18-Feb-93	18-Feb-93
Extraction Date:	04-Mar-93	04-Mar-93	04-Mar-93	04-Mar-93	04-Mar-93
Analysis Date:	04-Mar-93	04-Mar-93	04-Mar-93	04-Mar-93	04-Mar-93

Notes:
(1) ND = Not detected; LT = less than detection limit

TABLE FTA-3: Semivolatile Organic Compounds in Ground Water from the FTA
Fort George G. Meade, Maryland

Sample Location ID	FTAMW-1		FTAMW-2		FTAMW-3		93QC-152		93QC-252	
Field Sample ID	FIM0001Y		FIM0002Y		FIM0003Y		Z1XF152Y		Q1XR252Y	
Site Type	WELL		WELL		WELL		FBLK		RNSW	
Screen Start Depth (ft bgs)	3.5		3.6		3.6		-		-	
Screen End Depth (ft bgs)	13.5		13.6		13.6		-		-	
Media	CGW		CGW		CGW		CSW		CSW	
QC Type							field blank		rinse water	
Semivolatile Organic Compounds (ug/g)										
Chlorinated Monocyclic Arormatics										
1,3-Dichlorobenzene	3.4	LT	3.4	LT	3.4	LT	3.4	LT	3.4	LT
1,4-Dichlorobenzene	1.5	LT	1.5	LT	1.5	LT	1.5	LT	1.5	LT
1,2-Dichlorobenzene	1.2	LT	1.2	LT	1.2	LT	1.2	LT	1.2	LT
1,2,4-Trichlorobenzene	2.4	LT	2.4	LT	2.4	LT	2.4	LT	2.4	LT
1,2,3-Trichlorobenzene	5.8	LT	5.8	LT	5.8	LT	5.8	LT	5.8	LT
Hexachlorobenzene	12	LT	12	LT	12	LT	12	LT	12	LT
Nitromonocyclic Aromatics										
Nitrobenzene	3.7	LT	3.7	LT	3.7	LT	3.7	LT	3.7	LT
3-Nitrotoluene	2.9	LT	2.9	LT	2.9	LT	2.9	LT	2.9	LT
2,6-Dinitrotoluene	6.7	LT	6.7	LT	6.7	LT	6.7	LT	6.7	LT
2,4-Dinitrotoluene	5.8	LT	5.8	LT	5.8	LT	5.8	LT	5.8	LT
Nitrosamines										
N-Nitroso Dimethylamine	9.7	LT	9.7	LT	9.7	LT	9.7	LT	9.7	LT
N-Nitroso Di-N-Propylamine	6.8	LT	6.8	LT	6.8	LT	6.8	LT	6.8	LT
N-Nitroso Diphenylamine	3.7	LT	3.7	LT	3.7	LT	3.7	LT	3.7	LT
Phenols										
Phenol	2.2	LT	2.2	LT	2.2	LT	2.2	LT	2.2	LT
2-Chlorophenol	2.8	LT	2.8	LT	2.8	LT	2.8	LT	2.8	LT
2-Methylphenol / 2-Cresol	3.6	LT	3.6	LT	3.6	LT	3.6	LT	3.6	LT
4-Methylphenol / 4-Cresol	2.8	LT	2.8	LT	2.8	LT	2.8	LT	2.8	LT
2-Nitrophenol	8.2	LT	8.2	LT	8.2	LT	8.2	LT	8.2	LT
2,4-Dimethylphenol	4.4	LT	4.4	LT	4.4	LT	4.4	LT	4.4	LT
2,4-Dichlorophenol	8.4	LT	8.4	LT	8.4	LT	8.4	LT	8.4	LT
4-Chloro-3-Cresol / 3-Methyl-4-Chlorophenol	8.5	LT	8.5	LT	8.5	LT	8.5	LT	8.5	LT
2,4,6-Trichlorophenol	3.6	LT	3.6	LT	3.6	LT	3.6	LT	3.6	LT
2,4,5-Trichlorophenol	2.8	LT	2.8	LT	2.8	LT	2.8	LT	2.8	LT
2,3,6-Trichlorophenol	1.7	LT	1.7	LT	1.7	LT	1.7	LT	1.7	LT
2,4-Dinitrophenol	180	LT	180	LT	180	LT	180	LT	180	LT
4-Nitrophenol	96	LT	96	LT	96	LT	96	LT	96	LT
4,6-Dinitro-2-Cresol / Methyl-4,6-Dinitrophenol	50	ND	50	ND	50	ND	50	ND	50	ND
Pentachlorophenol	9.1	LT	9.1	LT	9.1	LT	9.1	LT	9.1	LT
PNAs										
Naphthalene	0.5	LT	0.5	LT	0.5	LT	0.5	LT	0.5	LT
2-Methylnaphthalene	1.3	LT	1.3	LT	1.3	LT	1.3	LT	1.3	LT
2-Chloronaphthalene	2.6	LT	2.6	LT	2.6	LT	2.6	LT	2.6	LT
Acenaphthylene	5.1	LT	5.1	LT	5.1	LT	5.1	LT	5.1	LT
Acenaphthene	5.8	LT	5.8	LT	5.8	LT	5.8	LT	5.8	LT
Fluorene	9.2	LT	9.2	LT	9.2	LT	9.2	LT	9.2	LT
Phenanthrene	9.9	LT	9.9	LT	9.9	LT	9.9	LT	9.9	LT
Anthracene	5.2	LT	5.2	LT	5.2	LT	5.2	LT	5.2	LT
Fluoranthene	24	LT	24	LT	24	LT	24	LT	24	LT
Pyrene	17	LT	17	LT	17	LT	17	LT	17	LT
Benzo [A] Anthracene	9.8	LT	9.8	LT	9.8	LT	9.8	LT	9.8	LT
Chrysene	7.4	LT	7.4	LT	7.4	LT	7.4	LT	7.4	LT
Benzo [B] Fluoranthene	10	LT	10	LT	10	LT	10	LT	10	LT
Benzo [K] Fluoranthene	10	LT	10	LT	10	LT	10	LT	10	LT
Benzo [A] Pyrene	14	LT	14	LT	14	LT	14	LT	14	LT
Indeno [1,2,3-C,D] Pyrene	21	LT	21	LT	21	LT	21	LT	21	LT
Dibenzo [A,H] Anthracene	12	LT	12	LT	12	LT	12	LT	12	LT
Benzo [G,H,I] Perylene	15	LT	15	LT	15	LT	15	LT	15	LT
PCBs										
Pcb 1016	9.1	ND	9.1	ND	9.1	ND	9.1	ND	9.1	ND
Pcb 1221	7.2	ND	7.2	ND	7.2	ND	7.2	ND	7.2	ND
Pcb 1232	9.9	ND	9.9	ND	9.9	ND	9.9	ND	9.9	ND
Pcb 1242	5.2	ND	5.2	ND	5.2	ND	5.2	ND	5.2	ND
Pcb 1248	38	ND	38	ND	38	ND	38	ND	38	ND
Pcb 1254	33	ND	33	ND	33	ND	33	ND	33	ND
Pcb 1260	13	ND	13	ND	13	ND	13	ND	13	ND
Collection Date:	18-Feb-93		18-Feb-93		18-Feb-93		18-Feb-93		18-Feb-93	
Extraction Date:	24-Feb-93		24-Feb-93		24-Feb-93		24-Feb-93		24-Feb-93	
Analysis Date:	04-Mar-93		04-Mar-93		04-Mar-93		04-Mar-93		04-Mar-93	

TABLE FTA-3: Semivolatile Organic Compounds in Ground Water from the FTA
Fort George G. Meade, Maryland

Sample Location ID	FTAMW-1		FTAMW-2		FTAMW-3		93QC-152		93QC-252	
Field Sample ID	FIM0001Y		FIM0002Y		FIM0003Y		Z1XF152Y		Q1XR252Y	
Site Type	WELL		WELL		WELL		FBLK		RNSW	
Screen Start Depth (ft bgs)	3.5		3.6		3.6		-		-	
Screen End Depth (ft bgs)	13.5		13.6		13.6		-		-	
Media	CGW		CGW		CGW		CSW		CSW	
QC Type							field blank		rinse water	
Phosphorus Containing										
Dimethylmethyl Phosphate	130	LT	130	LT	130	LT	130	LT	130	LT
Diisopropylmethyl Phosphonate	21	LT	21	LT	21	LT	21	LT	21	LT
Pesticides										
Alpha-Benzenehexachloride / Alpha-Hexachlorocyclohexane	5.3	LT	5.3	LT	5.3	LT	5.3	LT	5.3	LT
Beta-Benzenehexachloride / Beta-Hexachlorocyclohexane	17	LT	17	LT	17	LT	17	LT	17	LT
Atrazine	5.9	LT	5.9	LT	5.9	LT	5.9	LT	5.9	LT
Lindane / Gama-Benzenehexachloride /Gamma-Hexachlorocyclohexane	7.2	LT	7.2	LT	7.2	LT	7.2	LT	7.2	LT
Delta-Benzenehexachloride / Delta-Hexachlorocyclohexane	3	ND	3	ND	3	ND	3	ND	3	ND
Heptachlor	38	LT	38	LT	38	LT	38	LT	38	LT
Bromacil	2.9	LT	2.9	LT	2.9	LT	2.9	LT	2.9	LT
Malathion	21	LT	21	LT	21	LT	21	LT	21	LT
Parathion	37	LT	37	LT	37	LT	37	LT	37	LT
Aldrin	13	LT	13	LT	13	LT	13	LT	13	LT
Supona / 2-Chloro-1-(2,4-Dichlorophenyl) Vinyl Diethyl Phosphate	19	LT	19	LT	19	LT	19	LT	19	LT
Isodrin	7.8	LT	7.8	LT	7.8	LT	7.8	LT	7.8	LT
Heptachlor Epoxide	28	LT	28	LT	28	LT	28	LT	28	LT
Chlordane	37	ND	37	ND	37	ND	37	ND	37	ND
Vapona	8.5	LT	8.5	LT	8.5	LT	8.5	LT	8.5	LT
Alpha-Endosulfan / Endosulfan I	23	LT	23	LT	23	LT	23	LT	23	LT
2,2-Bis (Para-Chlorophenyl)-1,1-Dichloroethene	14	LT	14	LT	14	LT	14	LT	14	LT
Dieldrin	26	LT	26	LT	26	LT	26	LT	26	LT
Endrin Aldehyde	5	LT	5	LT	5	LT	5	LT	5	LT
Endrin	18	LT	18	LT	18	LT	18	LT	18	LT
2,2-Bis (Para-Chlorophenyl)-1,1-Dichloroethane	18	LT	18	LT	18	LT	18	LT	18	LT
Beta-Endosulfan / Endosulfan Ii	42	LT	42	LT	42	LT	42	LT	42	LT
2,2-Bis (Para-Chlorophenyl)-1,1,1-Trichloroethane	18	LT	18	LT	18	LT	18	LT	18	LT
Endosulfan Sulfate	50	LT	50	LT	50	LT	50	LT	50	LT
Methoxychlor	11	LT	11	LT	11	LT	11	LT	11	LT
Mirex	24	LT	24	LT	24	LT	24	LT	24	LT
Endrin Ketone	6	ND	6	ND	6	ND	6	ND	6	ND
Toxaphene	17	ND	17	ND	17	ND	17	ND	17	ND
Phthalates										
Dimethyl Phthalate	2.2	LT	2.2	LT	2.2	LT	2.2	LT	2.2	LT
Diethyl Phthalate	5.9	LT	5.9	LT	5.9	LT	5.9	LT	5.9	LT
Di-N-Butyl Phthalate	33	LT	33	LT	33	LT	33	LT	33	LT
Butylbenzyl Phthalate	28	LT	28	LT	28	LT	28	LT	28	LT
Bis (2-Ethylhexyl) Phthalate	7.7	LT	7.7	LT	7.7	LT	7.7	LT	7.7	LT
Di-N-Octyl Phthalate	1.5	LT	1.5	LT	1.5	LT	1.5	LT	1.5	LT
Sulfur Contaning Organics										
4-Chlorophenylmethyl Sulfide	10	LT	10	LT	10	LT	10	LT	10	LT
4-Chlorophenylmethyl Sulfoxide	15	LT	15	LT	15	LT	15	LT	15	LT
4-Chlorophenylmethyl Sulfone	5.3	LT	5.3	LT	5.3	LT	5.3	LT	5.3	LT
Other										
1,4-Oxathiane	27	LT	27	LT	27	LT	27	LT	27	LT
Bis (2-Chloroethyl) Ether	0.68	LT	0.68	LT	0.68	LT	0.68	LT	0.68	LT
Dicyclopentadiene	5.5	LT	5.5	LT	5.5	LT	5.5	LT	5.5	LT
Benzyl Alcohol	4	LT	4	LT	4	LT	4	LT	4	LT
Bis (2-Chloroisopropyl) Ether	5	LT	5	LT	5	LT	5	LT	5	LT
Dithiane	3.3	LT	3.3	LT	3.3	LT	3.3	LT	3.3	LT
Hexachloroethane	8.3	LT	8.3	LT	8.3	LT	8.3	LT	8.3	LT
Dibromochloropropane	12	LT	12	LT	12	LT	12	LT	12	LT
Isophorone	2.4	LT	2.4	LT	2.4	LT	2.4	LT	2.4	LT
Bis (2-Chloroethoxy) Methane	6.8	LT	6.8	LT	6.8	LT	6.8	LT	6.8	LT
Benzoic Acid	3.1	ND	3.1	ND	3.1	ND	3.1	ND	3.1	ND
4-Chloroaniline	1	ND	1	ND	1	ND	1	ND	1	ND
Hexachlorocyclopentadiene	54	LT	54	LT	54	LT	54	LT	54	LT
2-Nitroaniline	31	ND	31	ND	31	ND	31	ND	31	ND
3-Nitroaniline	15	LT	15	LT	15	LT	15	LT	15	LT
Dibenzofuran	5.1	LT	5.1	LT	5.1	LT	5.1	LT	5.1	LT
4-Chlorophenylphenyl Ether	23	LT	23	LT	23	LT	23	LT	23	LT
4-Nitroaniline	31	ND	31	ND	31	ND	31	ND	31	ND
1,2-Diphenylhydrazine	13	LT	13	LT	13	LT	13	LT	13	LT
2,6-Dinitroaniline	8.8	LT	8.8	LT	8.8	LT	8.8	LT	8.8	LT
4-Bromophenylphenyl Ether	22	LT	22	LT	22	LT	22	LT	22	LT
3,5-Dinitroaniline	21	LT	21	LT	21	LT	21	LT	21	LT
Hexachlorobutadiene	8.7	LT	8.7	LT	8.7	LT	8.7	LT	8.7	LT
3,3'-Dichlorobenzidine	5	LT	5	LT	5	LT	5	LT	5	LT
Collection Date:	18-Feb-93		18-Feb-93		18-Feb-93		18-Feb-93		18-Feb-93	
Extraction Date:	24-Feb-93		24-Feb-93		24-Feb-93		24-Feb-93		24-Feb-93	
Analysis Date:	04-Mar-93		04-Mar-93		04-Mar-93		04-Mar-93		04-Mar-93	

TABLE FTA-4: Volatile Organic Compounds and Petroleum Hydrocarbons Data for Fort George G. Meade, Maryland

Site ID	FTASE-1	
Field Sample ID	F1D0001A	
Site Type	SUMP	
Start Depth (ft)	0	
End Depth (ft)	0.5	
Media	CSE	
QC Type		
VOLATILE ORGANIC COMPOUNDS (ug/g)		
AROMATICS		
Benzene	0.57	
Toluene	4.7	
Ethylbenzene	1.4	
m-Xylene	4.3	
Xylenes	4.8	
Styrene	0.6	ND
CHLORINATED AROMATICS		
Chlorobenzene	0.1	LT
1,3-Dichlorobenzene	0.14	LT
Dichlorobenzene, nonspecific	1.6	
HALOGENATED ORGANICS		
Chloromethane	0.96	LT
Bromomethane	0.26	LT
Vinyl Chloride	1.8	LT
Chloroethane	0.64	LT
Methylene Chloride	4.4	LT
1,1-Dichloroethene	0.27	LT
1,1-Dichloroethane	0.49	LT
1,2-Dichloroethylenes (cis and trans isomers)	0.32	LT
Chloroform	0.24	LT
1,2-Dichloroethane	0.32	LT
1,1,1-Trichloroethane	0.2	LT
Carbon Tetrachloride	0.31	LT
Bromodichloromethane	0.2	LT
1,2-Dichloropropane	0.53	LT
Trichloroethene	0.23	LT
1,3-Dichloropropane	0.2	LT
Dibromochloromethane	0.25	LT
1,1,2-Trichloroethane	0.33	LT
2-Chloroethylvinyl Ether	0.5	LT
Bromoform	0.2	LT
1,1,2,2-Tetrachloroethane	0.2	LT
Tetrachloroethene	0.16	LT
Carbon Disulfide	0.6	ND
cis-1,3-Dichloropropene	0.6	ND
trans-1,3-Dichloropropene	0.6	ND
WATER SOLUBLES		
Acetone	3.3	LT
2-Butanone	4.3	LT
4-Methyl-2-Pentanone	0.63	LT
2-Hexanone	1	ND
OTHER		
Acrylonitrile	2	LT
Trichlorofluoromethane	0.23	LT
Vinyl Acetate	1	ND
TOTAL PETROLEUM HYDROCARBONS (ug/g)	86000	
Collection Date	18-Jan-94	
Extraction Date	26-Jan-94	
Analysis Date	26-Jan-94	

Notes:
(1) LT - less than detection limit; ND - not detected

TABLE FTA-5: Semivolatile Organic Compounds in Sediment from the Fire Training Area
Fort George G. Meade, Maryland

Site ID	FTASE-1	
Field Sample ID	F1D0001A	
Site Type	SUMP	
Start Depth (ft)	0	
End Depth (ft)	0.5	
Media	CSE	
QC Type		
SEMIVOLATILE ORGANIC COMPOUNDS (ug/g)		
CHLORINATED MONOCYCLIC AROMATICS		
1,3-Dichlorobenzene	0.042	LT
1,4-Dichlorobenzene	0.034	LT
1,2-Dichlorobenzene	11	
1,2,4-Trichlorobenzene	0.22	LT
1,2,3-Trichlorobenzene	0.032	LT
Hexachlorobenzene	0.08	LT
NITROSAMINES		
N-Nitroso dimethylamine	0.46	LT
N-Nitroso-Di-n-Propylamine	1.1	LT
N-Nitroso diphenylamine	60	
NITROMONOCYCLIC AROMATICS		
Nitrobenzene	1.8	LT
3-Nitrotoluene	0.34	LT
2,6-Dinitrotoluene	0.32	LT
2,4-Dinitrotoluene	1.4	LT
PHENOLS		
Phenol	0.052	LT
2-Chlorophenol	0.055	LT
2-Methyl Phenol	0.098	LT
4-Methyl Phenol	0.24	LT
2-Nitrophenol	1.1	LT
2,4-Dimethylphenol	3	LT
2,4-Dichlorophenol	0.065	LT
p-Chloro-m-cresol (4-Chloro-3-methylphenol)	0.93	LT
2,4,6-Trichlorophenol	0.061	LT
2,4,5-Trichlorophenol	0.49	LT
2,3,6-Trichlorophenol	0.62	LT
2,4-Dinitrophenol	4.7	LT
4-Nitrophenol	3.3	LT
Methyl-4,6-Dinitrophenol	0.8	LT
Dibenzofuran	0.38	LT
Pentachlorophenol	0.76	LT
PCB's		
PCB-1016	0.32	LT
PCB-1221	0.32	ND
PCB-1232	0.32	ND
PCB-1242	0.32	ND
PCB-1248	0.32	ND
PCB-1254	0.32	ND
PCB-1260	0.79	LT
PCB-1262	6.3	LT
PHTHALATES		
Dimethyl Phthalate	0.063	LT
Diethyl Phthalate	0.24	LT
Di-n-butyl Phthalate	1.3	LT
Butyl Benzyl Phthalate	1.8	LT
Bis (2-Ethyl hexyl) Phthalate	7.8	
Di-n-octyl Phthalate	0.23	LT
POLYNUCLEAR AROMATICS		
Naphthalene	30	
2-Methylnaphthalene	70	
2-Chloronaphthalene	0.24	LT
Acenaphthylene	0.033	LT
Acenaphthene	0.041	LT
Fluorene	27	
Phenanthrene	60	
Anthracene	23	
Fluoranthrene	2.2	
Pyrene	6.8	

TABLE FTA-5: Semivolatile Organic Compounds in Sediment from the Fire Training Area
Fort George G. Meade, Maryland

Site ID	FTASE-1	
Field Sample ID	F1D0001A	
Site Type	SUMP	
Start Depth (ft)	0	
End Depth (ft)	0.5	
Media	CSE	
QC Type		
POLYNUCLEAR AROMATICS		
Benzo (a) Anthracene	0.041	LT
Chrysene	2.7	
Benzo (b) Fluoranthene	0.31	LT
Benzo (k) Fluoranthene	0.13	LT
Benzo (a) Pyrene	1.2	LT
Indeno (1,2,3,cd) Pyrene	2.4	LT
Dibenzo (a,h) Anthracene	0.31	LT
Benzo (ghi) Perylene	0.18	LT
PESTICIDES		
Alpha-BHC	1.3	LT
Beta-BHC	1.3	LT
Atrazine	0.065	LT
Lindane (g-BHC)	0.1	LT
Delta-BHC	0.21	LT
Heptachlor	0.24	LT
Malathion	0.18	LT
Parathion	1.7	LT
Aldrin	1.3	LT
Supona	0.92	LT
Isodrin	0.48	LT
Heptachlor Epoxide	0.48	LT
Chlordane	0.68	LT
Vapona	0.068	LT
Endosulfan I	0.4	LT
4,4'DDE	0.068	LT
Dieldrin	0.079	LT
Endrin Aldehyde	1.8	LT
Endrine	1.3	LT
4,4'-DDD	0.064	LT
Endosulfan II	2.4	LT
4,4'DDT	0.1	LT
Endosulfan Sulfate	1.2	LT
Methoxychlor	0.26	LT
Mirex	0.14	LT
Endrine Ketone	0.28	ND
Toxaphene	12	LT
SULFUR CONTAINING		
p-Chlorophenylmethyl Sulfoxide	0.32	LT
p-Chlorophenylmethyl Sulfide	0.097	LT
4-Chlorophenylmethyl Sulfone	0.066	LT
OTHER		
1,4-Oxathaine (Thioxane)	0.075	LT
Bis (2-Chloroethyl) Ether	0.36	LT
Dicyclopentadiene	0.57	LT
Benzyl Alcohol	0.032	LT
Bis (2-Chloroisopropyl) Ether	0.44	LT
Dithiane	0.065	LT
Hexachloroethane	1.8	LT
Dibromochloropropane	0.071	LT
Isophorone	0.39	LT
Bis (2-Chloroethoxy) Methane	0.19	LT
Benzoic Acid	3.1	ND
4-Chloroaniline	0.63	ND
Hexachlorobutadiene	0.97	LT
2-Nitroniline	3.1	ND
3-Nitroaniline	3	LT
4-Nitroaniline	3.1	ND
4-Chlorophenyl Phenyl Ether	0.17	LT
1,2-Diphenyl Hydrazine	0.52	LT
2,6-Dinitroaniline	0.57	LT
4-Bromophenyl Phenyl Ether	0.041	LT
3,5-Dinitroaniline	1.6	LT
Hexachlorocyclopentadiene	0.52	LT
3,3'-Dichlorobenzidine	1.6	LT
Collection Date	18-Jan-94	
Extraction Date	20-Jan-94	
Analysis Date	09-Feb-94	

Notes:
(1) LT - less than detection limit; ND - not detected

Appendix J: Helicopter Hangar Area Analytical Results

Note: The term "LT" indicates that a certified analyte is not detected. The term "ND" is used for analytes that are added to certified methods but have not gone through the certification process. The term "LT" is followed by the certified reporting limit, it does not signify that a compound was actually detected but not included because results were below the Contract Required Detection Limit.

TABLE HHA-1: Volatile Organic Compounds and Petroleum Hydrocarbons in Soil from HHA
Fort George G. Meade, Maryland

Sample Location Identification	HHAMW-6	
Field Sample ID	HIB0006A	
Site Type	BORE	
Start Depth (ft bgs)	10	
End Depth (ft bgs)	12	
Media	CSO	
QC Type		
VOLATILE ORGANIC COMPOUNDS (ug/g)		
AROMATICS		
Benzene	0.1	LT
Toluene	0.1	LT
Ethylbenzene	0.19	LT
M-Xylene	0.23	LT
Xylenes	0.78	LT
Styrene	0.6	ND
CHLORINATED AROMATICS		
Chlorobenzene	0.1	LT
1,3-Dichlorobenzene	0.14	LT
Dichlorobenzene, Nonspecific	0.2	LT
HALOGENATED ORGANICS		
Chloromethane	0.96	LT
Bromomethane	0.26	LT
Vinyl Chloride	1.8	LT
Chloroethane	0.64	LT
Methylene Chloride	4.4	LT
1,1-Dichloroethene	0.27	LT
1,1-Dichloroethane	0.49	LT
1,2-Dichloroethylenes	0.32	LT
Chloroform	0.24	LT
1,2-Dichloroethane	0.32	LT
1,1,1-Trichloroethane	0.2	LT
Carbon Tetrachloride	0.31	LT
Bromodichloromethane	0.2	LT
1,2-Dichloropropane	0.53	LT
Trichloroethene	0.23	LT
1,3-Dichloropropane	0.2	LT
Dibromochloromethane	0.25	LT
1,1,2-Trichloroethane	0.33	LT
(2-Chloroethoxy) Ethene	0.5	LT
Bromoform	0.2	LT
1,1,2,2-Tetrachloroethane	0.2	LT
Tetrachloroethene	0.16	LT
Carbon Disulfide	0.6	ND
Cis-1,3-Dichloropropene	0.6	ND
Trans-1,3-Dichloropropene	0.6	ND
WATER SOLUBLE		
Acetone	3.3	LT
2-Butanone	4.3	LT
4-Methyl-2-Pentanone	0.63	LT
2-Hexanone	1	ND
OTHER		
Acrylonitrile	2	LT
Trichlorofluoromethane	0.23	LT
Vinyl Acetate	1	ND
TOTAL VOCs	**0**	
TOTAL PETROLEUM HYDROCARBONS (ug/g)	2	LT

Collection Date:	29-Jan-93
Extraction Date:	05-Feb-93
Analysis Date:	09-Feb-93

Notes:
(1) LT - less than detection limit; ND - not detected

TABLE HHA-2: Volatile Organic Compounds and Petroleum Hydrocarbons in Ground Water from the HHA
Fort George G. Meade, Maryland

Site ID	HHA-6	HHAME-1	HHAME-2	HHAME-3	HHAME-4	HHAME-5
Field Sample ID	H1M0006Y	H1ME001Y	H1ME002Y	H1ME003Y	H1ME004Y	H1ME005Y
Site Type	WELL	WELL	WELL	WELL	WELL	WELL
Screen Start Depth (ft bgs)	7	7	7	9	35	8
Screen End Depth (ft bgs)	17	17	17	19	45	18
Media	CGW	CGW	CGW	CGW	CGW	CGW
Total/Dissolved	Total	Total	Total	Total	Total	Total
QC Type						
VOLATILE ORGANIC COMPOUNDS (ug/L)						
AROMATICS						
Benzene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Toluene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Ethylbenzene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
m-Xylene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Xylenes	2 LT	2 LT	2 LT	2 LT	2 LT	2 LT
Styrene	5 ND	5 ND	5 ND	5 ND	5 ND	5 ND
CHLORINATED AROMATICS						
Chlorobenzene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,3-Dichlorobenzene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Dichlorobenzene, nonspecific	2 LT	2 LT	2 LT	2 LT	2 LT	2 LT
HALOGENATED ORGANICS						
Chloromethane	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT
Bromomethane	14 LT	14 LT	14 LT	14 LT	14 LT	14 LT
Vinyl Chloride	12 LT	12 LT	12 LT	12 LT	12 LT	12 LT
Chloroethane	8 LT	8 LT	8 LT	8 LT	8 LT	8 LT
Methylene Chloride	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,1-Dichloroethene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,1-Dichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,2-Dichloroethylenes (cis and trans isomers)	5 LT	5 LT	5 LT	5 LT	5 LT	5 LT
Chloroform	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,2-Dichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,1,1-Trichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Carbon Tetrachloride	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Bromodichloromethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,2-Dichloropropane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Trichloroethene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,3-Dichloropropane	4.8 LT	4.8 LT	4.8 LT	4.8 LT	4.8 LT	4.8 LT
Dibromochloromethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,1,2-Trichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
2-Chloroethylvinyl Ether	3.5 LT	3.5 LT	3.5 LT	3.5 LT	3.5 LT	3.5 LT
Bromoform	11 LT	11 LT	11 LT	11 LT	11 LT	11 LT
1,1,2,2-Tetrachloroethane	1.5 LT	1.5 LT	1.5 LT	1.5 LT	1.5 LT	1.5 LT
Tetrachloroethene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Carbon Disulfide	5 ND	5 ND	5 ND	5 ND	5 ND	5 ND
cis-1,3-Dichloropropene	5 ND	5 ND	5 ND	5 ND	5 ND	5 ND
trans-1,3-Dichloropropene	5 ND	5 ND	5 ND	5 ND	5 ND	5 ND
WATER SOLUBLES						
Acetone	8 LT	8 LT	8 LT	8 LT	8 LT	8 LT
2-Butanone	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT
4-Methyl-2-Pentanone	1.4 LT	1.4 LT	1.4 LT	1.4 LT	1.4 LT	1.4 LT
2-Hexanone	1 ND	1 ND	1 ND	1 ND	1 ND	1 ND
OTHER						
Acrylonitrile	8.4 LT	8.4 LT	8.4 LT	8.4 LT	8.4 LT	8.4 LT
Trichlorofluoromethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Vinyl Acetate	1 ND	1 ND	1 ND	1 ND	1 ND	1 ND
TOTAL VOC	0	0	0	0	0	0
TOTAL PETROLEUM HYDROCARBONS	100 LT	25000	100 LT	3700	100 LT	100 LT
Collection Date	20-Jan-94	20-Jan-94	20-Jan-94	20-Jan-94	20-Jan-94	20-Jan-94
Extraction Date	26-Jan-94	26-Jan-94	26-Jan-94	26-Jan-94	26-Jan-94	26-Jan-94
Analysis Date	26-Jan-94	26-Jan-94	26-Jan-94	26-Jan-94	26-Jan-94	26-Jan-94

Notes:
(1) LT - less than detection limit; ND - not detected
(2) ft bgs - feet below ground surface
(3) Sample depths assume a 10-foot screen (well construction information not available)

TABLE HHA-3: Semivolatile Organic Compounds in Ground Water from the HHA
Fort George G. Meade, Maryland
Table 1 of 2

Site ID	HHA-6	HHAME-1	HHAME-2	HHAME-3	HHAME-4	HHAME-5
Field Sample ID	H1M0006Y	H1ME001Y	H1ME002Y	H1ME003Y	H1ME004Y	H1ME005Y
Site Type	WELL	WELL	WELL	WELL	WELL	WELL
Screen Start Depth (ft bgs)	7	7	7	9	35	8
Screen End Depth (ft bgs)	17	17	17	19	45	18
Media	CGW	CGW	CGW	CGW	CGW	CGW
QC Type						
SEMIVOLATILE ORGANIC COMPOUNCS (ug/L)						
CHLORINATED MONOCYCLIC AROMATICS						
1,3-Dichlorobenzene	3.4 LT	3.4 LT	3.4 LT	3.4 LT	3.4 LT	3.4 LT
1,4-Dichlorobenzene	1.5 LT	1.5 LT	1.5 LT	1.5 LT	1.5 LT	1.5 LT
1,2-Dichlorobenzene	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT
1,2,4-Trichlorobenzene	2.4 LT	2.4 LT	2.4 LT	2.4 LT	2.4 LT	2.4 LT
1,2,3-Trichlorobenzene	5.8 LT	5.8 LT	5.8 LT	5.8 LT	5.8 LT	5.8 LT
Hexachlorobenzene	12 LT	12 LT	12 LT	12 LT	12 LT	12 LT
NITROSAMINES						
N-Nitroso dimethylamine	9.7 LT	9.7 LT	9.7 LT	9.7 LT	9.7 LT	9.7 LT
N-Nitroso-Di-n-Propylamine	6.8 LT	6.8 LT	6.8 LT	6.8 LT	6.8 LT	6.8 LT
N-Nitroso diphenylamine	3.7 LT	3.7 LT	3.7 LT	3.7 LT	3.7 LT	3.7 LT
NITROMONOCYCLIC AROMATICS						
Nitrobenzene	3.7 LT	3.7 LT	3.7 LT	3.7 LT	3.7 LT	3.7 LT
3-Nitrotoluene	2.9 LT	2.9 LT	2.9 LT	2.9 LT	2.9 LT	2.9 LT
2,6-Dinitrotoluene	6.7 LT	6.7 LT	6.7 LT	6.7 LT	6.7 LT	6.7 LT
2,4-Dinitrotoluene	5.8 LT	5.8 LT	5.8 LT	5.8 LT	5.8 LT	5.8 LT
PHENOLS						
Phenol	2.2 LT	2.2 LT	2.2 LT	2.2 LT	2.2 LT	2.2 LT
2-Chlorophenol	2.8 LT	2.8 LT	2.8 LT	2.8 LT	2.8 LT	2.8 LT
2-Methyl Phenol	3.6 LT	3.6 LT	3.6 LT	3.6 LT	3.6 LT	3.6 LT
4-Methyl Phenol	2.8 LT	2.8 LT	2.8 LT	2.8 LT	2.8 LT	2.8 LT
2-Nitrophenol	8.2 LT	8.2 LT	8.2 LT	8.2 LT	8.2 LT	8.2 LT
2,4-Dimethylphenol	4.4 LT	4.4 LT	4.4 LT	4.4 LT	4.4 LT	4.4 LT
2,4-Dichlorophenol	8.4 LT	8.4 LT	8.4 LT	8.4 LT	8.4 LT	8.4 LT
p-Chloro-m-cresol (4-Chloro-3-methylphenol)	8.5 LT	8.5 LT	8.5 LT	8.5 LT	8.5 LT	8.5 LT
2,4,6-Trichlorophenol	3.6 LT	3.6 LT	3.6 LT	3.6 LT	3.6 LT	3.6 LT
2,4,5-Trichlorophenol	2.8 LT	2.8 LT	2.8 LT	2.8 LT	2.8 LT	2.8 LT
2,3,6-Trichlorophenol	1.7 LT	1.7 LT	1.7 LT	1.7 LT	1.7 LT	1.7 LT
2,4-Dinitrophenol	180 LT	180 LT	180 LT	180 LT	180 LT	180 LT
4-Nitrophenol	96 LT	96 LT	96 LT	96 LT	96 LT	96 LT
2-Methyl-4,6-Dinitrophenol	50 ND	50 ND	50 ND	50 ND	50 ND	50 ND
Dibenzofuran	5.1 LT	5.1 LT	5.1 LT	5.1 LT	5.1 LT	5.1 LT
Pentachlorophenol	9.1 LT	9.1 LT	9.1 LT	9.1 LT	9.1 LT	9.1 LT
PHOSPHOROUS CONTAINING						
Dimethyl methylphosphonate	130 LT	130 LT	130 LT	130 LT	130 LT	130 LT
Diisopropyl methylphosphonate	21 LT	21 LT	21 LT	21 LT	21 LT	21 LT
PCB's						
PCB-1016	9.1 ND	9.1 ND	9.1 ND	9.1 ND	9.1 ND	9.1 ND
PCB-1221	9.1 ND	9.1 ND	9.1 ND	9.1 ND	9.1 ND	9.1 ND
PCB-1232	9.1 ND	9.1 ND	9.1 ND	9.1 ND	9.1 ND	9.1 ND
PCB-1242	9.1 ND	9.1 ND	9.1 ND	9.1 ND	9.1 ND	9.1 ND
PCB-1248	9.1 ND	9.1 ND	9.1 ND	9.1 ND	9.1 ND	9.1 ND
PCB-1254	9.1 ND	9.1 ND	9.1 ND	9.1 ND	9.1 ND	9.1 ND
PCB-1260	13 ND	13 ND	13 ND	13 ND	13 ND	13 ND
PHTHALATES						
Dimethyl Phthalate	2.2 LT	2.2 LT	2.2 LT	2.2 LT	2.2 LT	2.2 LT
Diethyl Phthalate	5.9 LT	5.9 LT	5.9 LT	5.9 LT	5.9 LT	5.9 LT
Di-n-butyl Phthalate	33 LT	33 LT	33 LT	33 LT	33 LT	33 LT
Butyl Benzyl Phthalate	28 LT	28 LT	28 LT	28 LT	28 LT	28 LT
Bis (2-Ethyl hexyl) Phthalate	7.7 LT	7.7 LT	7.7 LT	7.7 LT	48	7.7 LT
Di-n-octyl Phthalate	1.5 LT	1.5 LT	1.5 LT	1.5 LT	1.5 LT	1.5 LT
POLYNUCLEAR AROMATICS						
Naphthalene	0.5 LT	0.5 LT	0.5 LT	0.5 LT	0.5 LT	0.5 LT
2-Methylnaphthalene	1.3 LT	120	1.3 LT	28	1.3 LT	1.3 LT
2-Chloronaphthalene	2.6 LT	2.6 LT	2.6 LT	2.6 LT	2.6 LT	2.6 LT
Acenaphthylene	5.1 LT	5.1 LT	5.1 LT	5.1 LT	5.1 LT	5.1 LT
Acenaphthene	5.8 LT	5.8 LT	5.8 LT	5.8 LT	5.8 LT	5.8 LT
Fluorene	9.2 LT	9.2 LT	9.2 LT	9.2 LT	9.2 LT	9.2 LT
Phenanthrene	9.9 LT	9.9 LT	9.9 LT	9.9 LT	9.9 LT	9.9 LT
Anthracene	5.2 LT	5.2 LT	5.2 LT	5.2 LT	5.2 LT	5.2 LT
Fluoranthrene	24 LT	24 LT	24 LT	24 LT	24 LT	24 LT
Pyrene	17 LT	17 LT	17 LT	17 LT	17 LT	17 LT

Notes:
(1) LT - less than detection limit; ND - not detected
(2) ft bgs - feet below ground surface
(3) Sample depths assume a 10-foot screen (well construction information not available)

TABLE HHA-3: Semivolatile Organic Compounds in Ground Water from the HHA
Fort George G. Meade, Maryland
Page 2 of 2

Site ID	HHA-6	HHAME-1	HHAME-2	HHAME-3	HHAME-4	HHAME-5
Field Sample ID	H1M0006Y	H1ME001Y	H1ME002Y	H1ME003Y	H1ME004Y	H1ME005Y
Site Type	WELL	WELL	WELL	WELL	WELL	WELL
Screen Start Depth (ft bgs)	7	7	7	9	35	8
Screen End Depth (ft bgs)	17	17	17	19	45	18
Media	CGW	CGW	CGW	CGW	CGW	CGW
QC Type						
POLYNUCLEAR AROMATICS						
Benzo (a) Anthracene	9.8 LT	9.8 LT	9.8 LT	9.8 LT	9.8 LT	9.8 LT
Chrysene	7.4 LT	7.4 LT	7.4 LT	7.4 LT	7.4 LT	7.4 LT
Benzo (b) Fluoranthene	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT
Benzo (k) Fluoranthene	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT
Benzo (a) Pyrene	14 LT	14 LT	14 LT	14 LT	14 LT	14 LT
Indeno (1,2,3,cd) Pyrene	21 LT	21 LT	21 LT	21 LT	21 LT	21 LT
Dibenzo (a,h) Anthracene	12 LT	12 LT	12 LT	12 LT	12 LT	12 LT
Benzo (ghi) Perylene	15 LT	15 LT	15 LT	15 LT	15 LT	15 LT
PESTICIDES						
Alpha-BHC	5.3 LT	5.3 LT	5.3 LT	5.3 LT	5.3 LT	5.3 LT
Beta-BHC	17 LT	17 LT	17 LT	17 LT	17 LT	17 LT
Atrazine	5.9 LT	5.9 LT	5.9 LT	5.9 LT	5.9 LT	5.9 LT
Lindane (g-BHC)	7.2 LT	7.2 LT	7.2 LT	7.2 LT	7.2 LT	7.2 LT
Delta-BHC	3 ND	3 ND	3 ND	3 ND	3 ND	3 ND
Heptachlor	38 LT	38 LT	38 LT	38 LT	38 LT	38 LT
Bromacil	2.9 LT	2.9 LT	2.9 LT	2.9 LT	2.9 LT	2.9 LT
Malathion	21 LT	21 LT	21 LT	21 LT	21 LT	21 LT
Parathion	37 LT	37 LT	37 LT	37 LT	37 LT	37 LT
Aldrin	13 LT	13 LT	13 LT	13 LT	13 LT	13 LT
Supona	19 LT	19 LT	19 LT	19 LT	19 LT	19 LT
Isodrin	7.8 LT	7.8 LT	7.8 LT	7.8 LT	7.8 LT	7.8 LT
Heptachlor Epoxide	28 LT	28 LT	28 LT	28 LT	28 LT	28 LT
Chlordane	37 LT	37 LT	37 LT	37 LT	37 LT	37 LT
Vapona	8.5 LT	8.5 LT	8.5 LT	8.5 LT	8.5 LT	8.5 LT
Endosulfan I	23 LT	23 LT	23 LT	23 LT	23 LT	23 LT
4,4'DDE	14 LT	14 LT	14 LT	14 LT	14 LT	14 LT
Dieldrin	26 LT	26 LT	26 LT	26 LT	26 LT	26 LT
Endrin Aldehyde	5 LT	5 LT	5 LT	5 LT	5 LT	5 LT
Endrine	18 LT	18	18 LT	18 LT	18 LT	18 LT
4,4'-DDD	18 LT	18 LT	18 LT	18 LT	18 LT	18 LT
Endosulfan II	42 LT	42 LT	42 LT	42 LT	42 LT	42 LT
4,4'DDT	18 LT	18 LT	18 LT	18 LT	18 LT	18 LT
Endosulfan Sulfate	50 LT	50 LT	50 LT	50 LT	50 LT	50 LT
Methoxychlor	11 LT	11 LT	11 LT	11 LT	11 LT	11 LT
Mirex	24 LT	24 LT	24 LT	24 LT	24 LT	24 LT
Endrine Ketone	6 ND	6 ND	6 ND	6 ND	6 ND	6 ND
Toxaphene	17 ND	17 ND	17 ND	17 ND	17 ND	17 ND
SULFUR CONTAINING						
p-Chlorophenylmethyl Sulfoxide	15 LT	15 LT	15 LT	15 LT	15 LT	15 LT
p-Chlorophenylmethyl Sulfide	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT
4-Chlorophenylmethyl Sulfone	5.3 LT	5.3 LT	5.3 LT	5.3 LT	5.3 LT	5.3 LT
OTHER						
1,4-Oxathaine (Thioxane)	27 LT	27 LT	27 LT	27 LT	27 LT	27 LT
Bis (2-Chloroethyl) Ether	0.68 LT	0.68 LT	0.68 LT	0.68 LT	0.68 LT	0.68 LT
Dicyclopentadiene	5.5 LT	5.5 LT	5.5 LT	5.5 LT	5.5 LT	5.5 LT
Benzyl Alcohol	4 LT	4 LT	4 LT	4 LT	4 LT	4 LT
Bis (2-Chloroisopropyl) Ether	5 LT	5 LT	5 LT	5 LT	5 LT	5 LT
Dithiane	3.3 LT	3.3 LT	3.3 LT	3.3 LT	3.3 LT	3.3 LT
Hexachloroethane	8.3 LT	8.3 LT	8.3 LT	8.3 LT	8.3 LT	8.3 LT
Dibromochloropropane	12 LT	12 LT	12 LT	12 LT	12 LT	12 LT
Isophorone	2.4 LT	2.4 LT	2.4 LT	2.4 LT	2.4 LT	2.4 LT
Bis (2-Chloroethoxy) Methane	6.8 LT	6.8 LT	6.8 LT	6.8 LT	6.8 LT	6.8 LT
Benzoic Acid	3.1 ND	3.1 ND	3.1 ND	3.1 ND	3.1 ND	3.1 ND
4-Chloroaniline	1 ND	1 ND	1 ND	1 ND	1 ND	1 ND
Hexachlorobutadiene	8.7 LT	8.7 LT	8.7 LT	8.7 LT	8.7 LT	8.7 LT
2-Nitroniline	31 ND	31 ND	31 ND	31 ND	31 ND	31 ND
3-Nitroaniline	15 LT	15 LT	15 LT	15 LT	15 LT	15 LT
4-Nitroaniline	31 ND	31 ND	31 ND	31 ND	31 ND	31 ND
4-Chlorophenyl Phenyl Ether	23 LT	23 LT	23 LT	23 LT	23 LT	23 LT
1,2-Diphenyl Hydrazine	13 LT	13 LT	13 LT	13 LT	13 LT	13 LT
2,6-Dinitroaniline	8.8 LT	8.8 LT	8.8 LT	8.8 LT	8.8 LT	8.8 LT
4-Bromophenyl Phenyl Ether	22 LT	22 LT	22 LT	22 LT	22 LT	22 LT
3,5-Dinitroaniline	21 LT	21 LT	21 LT	21 LT	21 LT	21 LT
Hexachlorocyclopentadiene	54 LT	54 LT	54 LT	54 LT	54 LT	54 LT
3,3'-Dichlorobenzidine	5 LT	5 LT	5 LT	5 LT	5 LT	5 LT
TOTAL SVOC	0	138	0	28	48	0
Collection Date	20-Jan-94	20-Jan-94	20-Jan-94	20-Jan-94	20-Jan-94	20-Jan-94
Extraction Date	26-Jan-94	26-Jan-94	26-Jan-94	26-Jan-94	26-Jan-94	26-Jan-94
Analysis Date	31-Jan-94	01-Feb-94	31-Jan-94	01-Feb-94	01-Feb-94	31-Jan-94

Notes:
(1) LT - less than detection limit; ND - not detected
(2) ft bgs - feet below ground surface
(3) Sample depths assume a 10-foot screen (well construction information not available)

TABLE HHA-4: Metals Data for Ground Water from the HHA
Fort George G. Meade, Maryland

Site ID	HHA-6	HHA-6	HHAME-1	HHAME-1	HHAME-2	HHAME-2	HHAME-3	HHAME-3
Field Sample ID	H1M0006Y	H1M0006Z	H1ME001Y	H1ME001Z	H1ME002Y	H1ME002Z	H1ME003Y	H1ME003Z
Lab Sample ID	UB00466	UB00467	UB00472	UB00473	UB00464	UB00465	UB00474	UB00475
Site Type	WELL	WELL	WELL	WELL	WELL	WELL	WELL	WELL
Screen Start Depth (ft bgs)	7	7	7	7	7	7	9	9
Screen End Depth (ft bgs)	17	17	17	17	17	17	19	19
Total/Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
QC Type								
METALS (ug/L)								
Aluminum	5290	112 LT	535	112 LT	2950	112 LT	112 LT	112 LT
Antimony	60 LT	60 LT	60 LT	60 LT	60 LT	60 LT	60 LT	60 LT
Arsenic	9.36	15.2	8.91	14.6	8.42	11.1	14.3	11
Barium	58.5	42.4	39.9	36	21.7	7.74	31.2	30.4
Beryllium	1.12 LT	1.12 LT	1.12 LT	1.12 LT	1.12 LT	1.12 LT	1.12 LT	1.12 LT
Boron	230 LT	230 LT	230 LT	230 LT	230 LT	230 LT	230 LT	230 LT
Cadmium	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT
Calcium	71100	74100	40000	38300	12400	11400	22600	22600
Chromium	23.5	16.8 LT	16.8 LT	16.8 LT	100	16.8 LT	16.8 LT	16.8 LT
Cobalt	25 LT	25 LT	25 LT	25 LT	25 LT	25 LT	25 LT	25 LT
Copper	28.8	18.8 LT	38	18.8 LT	188	18.8 LT	18.8 LT	18.8 LT
Iron	36700	19300	45600	30700	31900	6580	26600	23700
Lead	17.6	14.5	7.79	4.47 LT	12.9	4.47 LT	4.47 LT	4.47 LT
Magnesium	10400	10400	5380	5150	1800	1660	3100	3070
Manganese	922	874	1480	1390	401	359	422	420
Mercury	0.1 LT	0.1 LT	0.1 LT	0.1 LT	0.128	0.1 LT	0.1 LT	0.1 LT
Molybdenum	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT
Nickel	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT
Potassium	9260	9310	5070	5120	2740	1930	3140	2970
Selenium	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT
Silver	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT
Sodium	8970	9280	6700	6560	3130	3270	8110	8280
Tellurium	118 LT	118 LT	118 LT	118 LT	118 LT	118 LT	118 LT	118 LT
Thallium	125 LT	125 LT	125 LT	125 LT	125 LT	125 LT	125 LT	125 LT
Tin	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT
Vanadium	27.6 LT	27.6 LT	27.6 LT	27.6 LT	129	27.6 LT	27.6 LT	27.6 LT
Zinc	47.8	18 LT	18 LT	18 LT	18 LT	26.8	18 LT	18 LT
Heavy Metals	50	30	17	15	121	11	14	11
Grand Total Metals	142828	123336	104860	87271	55781	25245	64018	61081
Collection Date	20-Jan-94	20-Jan-94	20-Jan-94	20-Jan-94	20-Jan-94	20-Jan-94	20-Jan-94	20-Jan-94
Extraction Date	13-Feb-94	13-Feb-94	13-Feb-94	13-Feb-94	13-Feb-94	13-Feb-94	13-Feb-94	13-Feb-94
Analysis Date	13-Feb-94	13-Feb-94	13-Feb-94	13-Feb-94	13-Feb-94	13-Feb-94	13-Feb-94	13-Feb-94

Notes:
(1) LT - less than detection limit; ND - not detected
(2) ft bgs - feet below ground surface
(3) Heavy metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag
(4) Sample depths assume a 10-foot screen (well construction information not available)

TABLE HHA-4: Metals Data for Ground Water from the HHA
Fort George G. Meade, Maryland

Site ID	HHAME-4		HHAME-4		HHAME-5		HHAME-5	
Field Sample ID	H1ME004Y		H1ME004Z		H1ME005Y		H1ME005Z	
Lab Sample ID	UB00476		UB00477		UB00470		UB00471	
Site Type	WELL		WELL		WELL		WELL	
Screen Start Depth (ft bgs)	35		35		8		8	
Screen End Depth (ft bgs)	45		45		18		18	
Total/Dissolved	Total		Dissolved		Total		Dissolved	
QC Type								
METALS (ug/L)								
Aluminum	11900		112	LT	2030		112	LT
Antimony	60	LT	59.7		60	LT	60	LT
Arsenic	45.3		2.35	LT	270		4.69	
Barium	246		30.4		54.6		19.6	
Beryllium	1.24		1.12	LT	1.12	LT	1.12	LT
Boron	230	LT	230	LT	230	LT	230	LT
Cadmium	35.2		6.78	LT	17.4		6.78	LT
Calcium	96200		85800		57200		55600	
Chromium	216		16.8	LT	18.9		16.8	LT
Cobalt	82.2		25	LT	25	LT	25	LT
Copper	375		18.8	LT	18.8	LT	18.8	LT
Iron	186000		77.5	LT	131000		27000	
Lead	220		4.47	LT	40.1		4.47	LT
Magnesium	16800		10200		6840		5280	
Manganese	13000		117		1370		1350	
Mercury	0.918		0.221		0.1	LT	0.1	LT
Molybdenum	52.7	LT	52.7	LT	52.7	LT	52.7	LT
Nickel	74.7		32.1	LT	32.1	LT	32.1	LT
Potassium	8260		6580		7450		7450	
Selenium	5.18		2.53	LT	2.53	LT	2.53	LT
Silver	10	LT	10	LT	10	LT	10	LT
Sodium	10500		10800		7830		8430	
Tellurium	118	LT	118	LT	118	LT	118	LT
Thallium	125	LT	125	LT	125	LT	125	LT
Tin	59.9	LT	59.9	LT	59.9	LT	59.9	LT
Vanadium	532		27.6	LT	27.6	LT	27.6	LT
Zinc	2820		137		216		18	LT
Heavy Metals	599		60		346		5	
Grand Total Metals	347314		113724		214337		105134	
Collection Date	20-Jan-94		20-Jan-94		20-Jan-94		20-Jan-94	
Extraction Date	13-Feb-94		13-Feb-94		13-Feb-94		13-Feb-94	
Analysis Date	13-Feb-94		13-Feb-94		13-Feb-94		13-Feb-94	

Notes:
(1) LT - less than detection limit; ND - not detected
(2) ft bgs - feet below ground surface
(3) Heavy metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag
(4) Sample depths assume a 10-foot screen (well construction information not available)

TABLE HHA-5: Volatile Organic Compounds in Surface Water from the HHA
Fort George G. Meade, Maryland

Site ID	HHASW-1	HHASW-2	HHASW-3	HHASW-4	HHASW-5
Field Sample ID	H1T0001A	H1T0002A	H1T0003A	H1T0004Y	H1T0005Y
Site Type	STRM	STRM	STRM	STRM	STRM
Start Depth (ft bgs)	0	0	0	0	0
End Depth (ft bgs)	0.5	0.5	0.5	0.5	0.5
Media	CSW	CSW	CSW	CSW	CSW
Total/Dissolved	Total	Total	Total	Total	Total
QC Type					
VOLATILE ORGANIC COMPOUNDS (ug/L)					
AROMATICS					
Benzene	1 LT	1 LT	1 LT	1 LT	1 LT
Toluene	1 LT	1 LT	1 LT	1 LT	1 LT
Ethylbenzene	1 LT	1 LT	1 LT	1 LT	1 LT
m-Xylene	1 LT	1 LT	1 LT	1 LT	1 LT
Xylenes	2 LT	2 LT	2 LT	2 LT	2 LT
Styrene	5 ND	5 ND	5 ND	5 ND	5 ND
CHLORINATED AROMATICS					
Chlorobenzene	1 LT	1 LT	1 LT	1 LT	1 LT
1,3-Dichlorobenzene	1 LT	1 LT	1 LT	1 LT	1 LT
Dichlorobenzene, nonspecific	2 LT	2 LT	2 LT	2 LT	2 LT
HALOGENATED ORGANICS					
Chloromethane	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT
Bromomethane	14 LT	14 LT	14 LT	14 LT	14 LT
Vinyl Chloride	12 LT	12 LT	12 LT	12 LT	12 LT
Chloroethane	8 LT	8 LT	8 LT	8 LT	8 LT
Methylene Chloride	1 LT	1 LT	1 LT	1 LT	1 LT
1,1-Dichloroethene	1 LT	1 LT	1 LT	1 LT	1 LT
1,1-Dichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT
1,2-Dichloroethylenes (cis and trans isomers)	5 LT	5 LT	5 LT	5 LT	5 LT
Chloroform	1 LT	1 LT	1 LT	1 LT	1 LT
1,2-Dichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT
1,1,1-Trichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT
Carbon Tetrachloride	1 LT	1 LT	1 LT	1 LT	1 LT
Bromodichloromethane	1 LT	1 LT	1 LT	1 LT	1 LT
1,2-Dichloropropane	1 LT	1 LT	1 LT	1 LT	1 LT
Trichloroethene	1 LT	1 LT	1 LT	1 LT	1 LT
1,3-Dichloropropane	4.8 LT	4.8 LT	4.8 LT	4.8 LT	4.8 LT
Dibromochloromethane	1 LT	1 LT	1 LT	1 LT	1 LT
1,1,2-Trichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT
2-Chloroethylvinyl Ether	3.5 LT	3.5 LT	3.5 LT	3.5 LT	3.5 LT
Bromoform	11 LT	11 LT	11 LT	11 LT	11 LT
1,1,2,2-Tetrachloroethane	1.5 LT	1.5 LT	1.5 LT	1.5 LT	1.5 LT
Tetrachloroethene	1 LT	1 LT	1 LT	1 LT	1 LT
Carbon Disulfide	5 ND	5 ND	5 ND	5 ND	5 ND
cis-1,3-Dichloropropene	5 ND	5 ND	5 ND	5 ND	5 ND
trans-1,3-Dichloropropene	5 ND	5 ND	5 ND	5 ND	5 ND
WATER SOLUBLES					
Acetone	8 LT	8 LT	8 LT	8 LT	8 LT
2-Butanone	10 LT	10 LT	10 LT	10 LT	10 LT
4-Methyl-2-Pentanone	1.4 LT	1.4 LT	1.4 LT	1.4 LT	1.4 LT
2-Hexanone	1 ND	1 ND	1 ND	1 ND	1 ND
OTHER					
Acrylonitrile	8.4 LT	8.4 LT	8.4 LT	8.4 LT	8.4 LT
Trichlorofluoromethane	1 LT	1 LT	1 LT	1 LT	1 LT
Vinyl Acetate	1 ND	1 ND	1 ND	1 ND	1 ND
TOTAL VOC	0	0	0	0	0
TOTAL PETROLEUM HYDROCARBONS (ug/L)	100 LT	100 LT	100 LT	100 LT	100 LT
Collection Date	21-Jan-94	21-Jan-94	21-Jan-94	21-Jan-94	21-Jan-94
Extraction Date	27-Jan-94	27-Jan-94	27-Jan-94	27-Jan-94	27-Jan-94
Analysis Date	27-Jan-94	27-Jan-94	27-Jan-94	27-Jan-94	27-Jan-94

Notes:
(1) LT - less than detection limit; ND - not detected
(2) ft bgs - feet below ground surface
(3) Heavy metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag
(4) Sample depths assume a 10-foot screen (well construction information not available)

TABLE HHA-6: Semivolatile Organic Compounds in Surface Water from the HHA
Fort George G. Meade, Maryland

Site ID	HHASW-1		HHASW-2		HHASW-3		HHASW-4		HHASW-5	
Site Type	STRM		STRM		STRM		STRM		STRM	
Field Sample ID	H1T0001A		H1T0002A		H1T0003A		H1T0004Y		H1T0005Y	
Start Depth (ft bgs)	0		0		0		0		0	
End Depth (ft bgs)	0.5		0.5		0.5		0.5		0.5	
Media	CSW		CSW		CSW		CSW		CSW	
Total/Dissolved	Total		Total		Total		Total		Total	
QC Type										
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L										
CHLORINATED MONOCYCLIC AROMATICS										
1,3-Dichlorobenzene	3.4	LT	3.4	LT	3.4	LT	3.4	LT	3.4	LT
1,4-Dichlorobenzene	1.5	LT	1.5	LT	1.5	LT	1.5	LT	1.5	LT
1,2-Dichlorobenzene	1.2	LT	1.2	LT	1.2	LT	1.2	LT	1.2	LT
1,2,4-Trichlorobenzene	2.4	LT	2.4	LT	2.4	LT	2.4	LT	2.4	LT
1,2,3-Trichlorobenzene	5.8	LT	5.8	LT	5.8	LT	5.8	LT	5.8	LT
Hexachlorobenzene	12	LT	12	LT	12	LT	12	LT	12	LT
NITROSAMINES										
N-Nitroso dimethylamine	9.7	LT	9.7	LT	9.7	LT	9.7	LT	9.7	LT
N-Nitroso-Di-n-Propylamine	6.8	LT	6.8	LT	6.8	LT	6.8	LT	6.8	LT
N-Nitroso diphenylamine	3.7	LT	3.7	LT	3.7	LT	3.7	LT	3.7	LT
NITROMONOCYCLIC AROMATICS										
Nitrobenzene	3.7	LT	3.7	LT	3.7	LT	3.7	LT	3.7	LT
3-Nitrotoluene	2.9	LT	2.9	LT	2.9	LT	2.9	LT	2.9	LT
2,6-Dinitrotoluene	6.7	LT	6.7	LT	6.7	LT	6.7	LT	6.7	LT
2,4-Dinitrotoluene	5.8	LT	5.8	LT	5.8	LT	5.8	LT	5.8	LT
PHENOLS										
Phenol	2.2	LT	2.2	LT	2.2	LT	2.2	LT	2.2	LT
2-Chlorophenol	2.8	LT	2.8	LT	2.8	LT	2.8	LT	2.8	LT
2-Methyl Phenol	3.6	LT	3.6	LT	3.6	LT	3.6	LT	3.6	LT
4-Methyl Phenol	2.8	LT	2.8	LT	2.8	LT	2.8	LT	2.8	LT
2-Nitrophenol	8.2	LT	8.2	LT	8.2	LT	8.2	LT	8.2	LT
2,4-Dimethylphenol	4.4	LT	4.4	LT	4.4	LT	4.4	LT	4.4	LT
2,4-Dichlorophenol	8.4	LT	8.4	LT	8.4	LT	8.4	LT	8.4	LT
p-Chloro-m-cresol (4-Chloro-3-methylphenol)	8.5	LT	8.5	LT	8.5	LT	8.5	LT	8.5	LT
2,4,6-Trichlorophenol	3.6	LT	3.6	LT	3.6	LT	3.6	LT	3.6	LT
2,4,5-Trichlorophenol	2.8	LT	2.8	LT	2.8	LT	2.8	LT	2.8	LT
2,3,6-Trichlorophenol	1.7	LT	1.7	LT	1.7	LT	1.7	LT	1.7	LT
2,4-Dinitrophenol	180	LT	180	LT	180	LT	180	LT	180	LT
4-Nitrophenol	96	LT	96	LT	96	LT	96	LT	96	LT
Methyl-4,6-Dinitrophenol	50	ND	50	ND	50	ND	50	ND	50	ND
Dibenzofuran	5.1	LT	5.1	LT	5.1	LT	5.1	LT	5.1	LT
Pentachlorophenol	9.1	LT	9.1	LT	9.1	LT	9.1	LT	9.1	LT
PHOSPHOROUS CONTAINING										
Dimethyl methylphosphonate	130	LT	130	LT	130	LT	130	LT	130	LT
Diisopropyl methylphosphonate	21	LT	21	LT	21	LT	21	LT	21	LT
PCB's										
PCB-1016	9.1	ND	9.1	ND	9.1	ND	9.1	ND	9.1	ND
PCB-1221	9.1	ND	9.1	ND	9.1	ND	9.1	ND	9.1	ND
PCB-1232	9.1	ND	9.1	ND	9.1	ND	9.1	ND	9.1	ND
PCB-1242	9.1	ND	9.1	ND	9.1	ND	9.1	ND	9.1	ND
PCB-1248	9.1	ND	9.1	ND	9.1	ND	9.1	ND	9.1	ND
PCB-1254	9.1	ND	9.1	ND	9.1	ND	9.1	ND	9.1	ND
PCB-1260	13	ND	13	ND	13	ND	13	ND	13	ND
PHTHALATES										
Dimethyl Phthalate	2.2	LT	2.2	LT	2.2	LT	2.2	LT	2.2	LT
Diethyl Phthalate	5.9	LT	5.9	LT	5.9	LT	5.9	LT	5.9	LT
Di-n-butyl Phthalate	33	LT	33	LT	33	LT	33	LT	33	LT
Butyl Benzyl Phthalate	28	LT	28	LT	28	LT	28	LT	28	LT
Bis (2-Ethyl hexyl) Phthalate	7.7	LT	7.7	LT	7.7	LT	7.7	LT	7.7	LT
Di-n-octyl Phthalate	1.5	LT	1.5	LT	1.5	LT	1.5	LT	1.5	LT
POLYNUCLEAR AROMATICS										
Naphthalene	0.5	LT	0.5	LT	0.5	LT	0.5	LT	0.5	LT
2-Methylnaphthalene	1.3	LT	1.3	LT	1.3	LT	1.3	LT	1.3	LT
2-Chloronaphthalene	2.6	LT	2.6	LT	2.6	LT	2.6	LT	2.6	LT
Acenaphthylene	5.1	LT	5.1	LT	5.1	LT	5.1	LT	5.1	LT
Acenaphthene	5.8	LT	5.8	LT	5.8	LT	5.8	LT	5.8	LT
Fluorene	9.2	LT	9.2	LT	9.2	LT	9.2	LT	9.2	LT
Phenanthrene	9.9	LT	9.9	LT	9.9	LT	9.9	LT	9.9	LT
Anthracene	5.2	LT	5.2	LT	5.2	LT	5.2	LT	5.2	LT
Fluoranthrene	24	LT	24	LT	24	LT	24	LT	24	LT
Pyrene	17	LT	17	LT	17	LT	17	LT	17	LT

TABLE HHA-6: Semivolatile Organic Compounds in Surface Water from the HHA
Fort George G. Meade, Maryland

Site ID	HHASW-1	HHASW-2	HHASW-3	HHASW-4	HHASW-5
Site Type	STRM	STRM	STRM	STRM	STRM
Field Sample ID	H1T0001A	H1T0002A	H1T0003A	H1T0004Y	H1T0005Y
Start Depth (ft bgs)	0	0	0	0	0
End Depth (ft bgs)					
Media	CSW	CSW	CSW	CSW	CSW
Total/Dissolved	Total	Total	Total	Total	Total
QC Type					
POLYNUCLEAR AROMATICS					
Benzo (a) Anthracene	9.8 LT	9.8 LT	9.8 LT	9.8 LT	9.8 LT
Chrysene	7.4 LT	7.4 LT	7.4 LT	7.4 LT	7.4 LT
Benzo (b) Fluoranthene	10 LT	10 LT	10 LT	10 LT	10 LT
Benzo (k) Fluoranthene	10 LT	10 LT	10 LT	10 LT	10 LT
Benzo (a) Pyrene	14 LT	14 LT	14 LT	14 LT	14 LT
Indeno (1,2,3,cd) Pyrene	21 LT	21 LT	21 LT	21 LT	21 LT
Dibenzo (a,h) Anthracene	12 LT	12 LT	12 LT	12 LT	12 LT
Benzo (ghi) Perylene	15 LT	15 LT	15 LT	15 LT	15 LT
PESTICIDES					
Alpha-BHC	5.3 LT	5.3 LT	5.3 LT	5.3 LT	5.3 LT
Beta-BHC	17 LT	17 LT	17 LT	17 LT	17 LT
Atrazine	5.9 LT	5.9 LT	5.9 LT	5.9 LT	5.9 LT
Lindane (g-BHC)	7.2 LT	7.2 LT	7.2 LT	7.2 LT	7.2 LT
Delta-BHC	3 ND	3 ND	3 ND	3 ND	3 ND
Heptachlor	38 LT	38 LT	38 LT	38 LT	38 LT
Bromacil	2.9 LT	2.9 LT	2.9 LT	2.9 LT	2.9 LT
Malathion	21 LT	21 LT	21 LT	21 LT	21 LT
Parathion	37 LT	37 LT	37 LT	37 LT	37 LT
Aldrin	13 LT	13 LT	13 LT	13 LT	13 LT
Supona	19 LT	19 LT	19 LT	19 LT	19 LT
Isodrin	7.8 LT	7.8 LT	7.8 LT	7.8 LT	7.8 LT
Heptachlor Epoxide	28 LT	28 LT	28 LT	28 LT	28 LT
Chlordane	37 LT	37 LT	37 LT	37 LT	37 LT
Vapona	8.5 LT	8.5 LT	8.5 LT	8.5 LT	8.5 LT
Endosulfan I	23 LT	23 LT	23 LT	23 LT	23 LT
4,4'DDE	14 LT	14 LT	14 LT	14 LT	14 LT
Dieldrin	26 LT	26 LT	26 LT	26 LT	26 LT
Endrin Aldehyde	5 LT	5 LT	5 LT	5 LT	5 LT
Endrine	18 LT	18 LT	18 LT	18 LT	18 LT
4,4'-DDD	18 LT	18 LT	18 LT	18 LT	18 LT
Endosulfan II	42 LT	42 LT	42 LT	42 LT	42 LT
4,4'-DDT	18 LT	18 LT	18 LT	18 LT	18 LT
Endosulfan Sulfate	50 LT	50 LT	50 LT	50 LT	50 LT
Methoxychlor	11 LT	11 LT	11 LT	11 LT	11 LT
Mirex	24 LT	24 LT	24 LT	24 LT	24 LT
Endrine Ketone	6 ND	6 ND	6 ND	6 ND	6 ND
Toxaphene	17 ND	17 ND	17 ND	17 ND	17 ND
SULFUR CONTAINING					
p-Chlorophenylmethyl Sulfoxide	15 LT	15 LT	15 LT	15 LT	15 LT
p-Chlorophenylmethyl Sulfide	10 LT	10 LT	10 LT	10 LT	10 LT
4-Chlorophenylmethyl Sulfone	5.3 LT	5.3 LT	5.3 LT	5.3 LT	5.3 LT
OTHER					
1,4-Oxathaine (Thioxane)	27 LT	27 LT	27 LT	27 LT	27 LT
Bis (2-Chloroethyl) Ether	0.68 LT	0.68 LT	0.68 LT	0.68 LT	0.68 LT
Dicyclopentadiene	5.5 LT	5.5 LT	5.5 LT	5.5 LT	5.5 LT
Benzyl Alcohol	4 LT	4 LT	4 LT	4 LT	4 LT
Bis (2-Chloroisopropyl) Ether	5 LT	5 LT	5 LT	5 LT	5 LT
Dithiane	3.3 LT	3.3 LT	3.3 LT	3.3 LT	3.3 LT
Hexachloroethane	8.3 LT	8.3 LT	8.3 LT	8.3 LT	8.3 LT
Dibromochloropropane	12 LT	12 LT	12 LT	12 LT	12 LT
Isophorone	2.4 LT	2.4 LT	2.4 LT	2.4 LT	2.4 LT
Bis (2-Chloroethoxy) Methane	6.8 LT	6.8 LT	6.8 LT	6.8 LT	6.8 LT
Benzoic Acid	3.1 ND	3.1 ND	3.1 ND	3.1 ND	3.1 ND
4-Chloroaniline	1 ND	1 ND	1 ND	1 ND	1 ND
Hexachlorobutadiene	8.7 LT	8.7 LT	8.7 LT	8.7 LT	8.7 LT
2-Nitroniline	31 ND	31 ND	31 ND	31 ND	31 ND
3-Nitroaniline	15 LT	15 LT	15 LT	15 LT	15 LT
4-Nitroaniline	31 ND	31 ND	31 ND	31 ND	31 ND
4-Chlorophenyl Phenyl Ether	23 LT	23 LT	23 LT	23 LT	23 LT
1,2-Diphenyl Hydrazine	13 LT	13 LT	13 LT	13 LT	13 LT
2,6-Dinitroaniline	8.8 LT	8.8 LT	8.8 LT	8.8 LT	8.8 LT
4-Bromophenyl Phenyl Ether	22 LT	22 LT	22 LT	22 LT	22 LT
3,5-Dinitroaniline	21 LT	21 LT	21 LT	21 LT	21 LT
Hexachlorocyclopentadiene	54 LT	54 LT	54 LT	54 LT	54 LT
3,3'-Dichlorobenzidine	5 LT	5 LT	5 LT	5 LT	5 LT
TOTAL SVOCS	0	0	0	0	0
Collection Date	21-Jan-94	21-Jan-94	21-Jan-94	21-Jan-94	21-Jan-94
Extraction Date	27-Jan-94	27-Jan-94	27-Jan-94	27-Jan-94	27-Jan-94
Analysis Date	08-Feb-94	08-Feb-94	08-Feb-94	08-Feb-94	08-Feb-94

Notes:
(1) LT - less than detection limit; ND - not detected
(2) ft bgs - feet below ground surface

TABLE HHA-7: Metals in Surface Water from the HHA
Fort George G. Meade, Maryland
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Site ID	HHASW-1	HHASW-2	HHASW-3	HHASW-4	HHASW-5
Field Sample ID	H1T0001A	H1T0002A	H1T0003A	H1T0004Y	H1T0005Y
Site Type	STRM	STRM	STRM	STRM	STRM
Start Depth (ft bgs)	0	0	0	0	0
End Depth (ft bgs)	0.5	0.5	0.5	0.5	0.5
Media	CSW	CSW	CSW	CSW	CSW
Total/Dissolved	Total	Total	Total	Total	Total
QC Type					
METALS (ug/L)					
Aluminum	112 LT	2600	335	349	527
Antimony	60 LT	60 LT	60 LT	60 LT	60 LT
Arsenic	2.35 LT	2.35 LT	2.35 LT	2.35 LT	2.35 LT
Barium	61.8	66.2	64.5	74.7	64.9
Beryllium	1.12 LT	1.12 LT	1.12 LT	1.12 LT	1.12 LT
Boron	230 LT	230 LT	230 LT	230 LT	230 LT
Cadmium	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT
Calcium	31400	32500	28700	28900	30400
Chromium	16.8 LT	16.8 LT	16.8 LT	16.8 LT	16.8 LT
Cobalt	25 LT	25 LT	25 LT	25 LT	25 LT
Copper	18.8 LT	18.8 LT	18.8 LT	18.8 LT	18.8 LT
Iron	452	5180	793	841	1330
Lead	4.47 LT	4.47 LT	4.47 LT	4.47 LT	4.47 LT
Magnesium	6390	6140	6410	7080	6440
Manganese	139	144	147	164	162
Mercury	0.1 LT	0.1 LT	0.1 LT	0.1 LT	0.1 LT
Molybdenum	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT
Nickel	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT
Potassium	5010	4250	4950	5420	5120
Selenium	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT
Silver	10 LT	10 LT	10 LT	10 LT	10 LT
Sodium	90000	190000	99000	97000	100000
Tellurium	118 LT	118 LT	118 LT	118 LT	118 LT
Thallium	125 LT	125 LT	125 LT	125 LT	125 LT
Tin	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT
Vanadium	27.6 LT	27.6 LT	27.6 LT	27.6 LT	27.6 LT
Zinc	18 LT	97.7	19.6	24.3	24.3
Heavy Metals	0	0	0	0	0
Grand Total Metals	133453	240978	140419	139853	144068
Collection Date	21-Jan-94	21-Jan-94	21-Jan-94	21-Jan-94	21-Jan-94
Extraction Date	13-Feb-94	13-Feb-94	13-Feb-94	13-Feb-94	13-Feb-94
Analysis Date	13-Feb-94	13-Feb-94	13-Feb-94	13-Feb-94	13-Feb-94

Notes:
(1) LT - less than detection limit; ND - not detected
(2) ft bgs - feet below ground surface

TABLE HHA-8: Volatile Organic Compounds in Sediment from the HHA
Fort George G. Meade, Maryland

Site ID	HHASE-1	HHASE-2	HHASE-3	HHASE-4	94QC-402
Field Sample ID	H1D0001A	H1D0002A	H1D0003A	H1D0004A	Q1DD402A
Site Type	STRM	STRM	STRM	STRM	STRM
Start Depth (ft bgs)	0	0	0	0	0
End Depth (ft bgs)	0.5	0.5	0.5	0.5	0.5
Media	CSE	CSE	CSE	CSE	CSE
QC Type					Dup of HHASE-4
VOLATILE ORGANIC COMPOUNDS (ug/g)					
AROMATICS					
Benzene	0.1 LT	0.1 LT	0.1 LT	0.1 LT	0.1 LT
Toluene	0.1 LT	0.1 LT	0.1 LT	0.1 LT	0.1 LT
Ethylbenzene	0.19 LT	0.19 LT	0.19 LT	0.19 LT	0.19 LT
m-Xylene	0.23 LT	0.23 LT	0.23 LT	0.23 LT	0.23 LT
Xylenes	0.78 LT	0.78 LT	0.78 LT	0.78 LT	0.78 LT
Styrene	0.6 ND	0.6 ND	0.6 ND	0.6 ND	0.6 ND
CHLORINATED AROMATICS					
Chlorobenzene	0.1 LT	0.1 LT	0.1 LT	0.1 LT	0.1 LT
1,3-Dichlorobenzene	0.14 LT	0.14 LT	0.14 LT	0.14 LT	0.14 LT
Dichlorobenzene, nonspecific	0.2 LT	0.2 LT	0.2 LT	0.2 LT	0.2 LT
HALOGENATED ORGANICS					
Chloromethane	0.96 LT	0.96 LT	0.96 LT	0.96 LT	0.96 LT
Bromomethane	0.26 LT	0.26 LT	0.26 LT	0.26 LT	0.26 LT
Vinyl Chloride	1.8 LT	1.8 LT	1.8 LT	1.8 LT	1.8 LT
Chloroethane	0.64 LT	0.64 LT	0.64 LT	0.64 LT	0.64 LT
Methylene Chloride	4.4 LT	4.4 LT	4.4 LT	4.4 LT	4.4 LT
1,1-Dichloroethene	0.27 LT	0.27 LT	0.27 LT	0.27 LT	0.27 LT
1,1-Dichloroethane	0.49 LT	0.49 LT	0.49 LT	0.49 LT	0.49 LT
1,2-Dichloroethylenes (cis and trans isomers)	0.32 LT	0.32 LT	0.32 LT	0.32 LT	0.32 LT
Chloroform	0.24 LT	0.24 LT	0.24 LT	0.24 LT	0.24 LT
1,2-Dichloroethane	0.32 LT	0.32 LT	0.32 LT	0.32 LT	0.32 LT
1,1,1-Trichloroethane	0.2 LT	0.2 LT	0.2 LT	0.2 LT	0.2 LT
Carbon Tetrachloride	0.31 LT	0.31 LT	0.31 LT	0.31 LT	0.31 LT
Bromodichloromethane	0.2 LT	0.2 LT	0.2 LT	0.2 LT	0.2 LT
1,2-Dichloropropane	0.53 LT	0.53 LT	0.53 LT	0.53 LT	0.53 LT
Trichloroethene	0.23 LT	0.23 LT	0.23 LT	0.23 LT	0.23 LT
1,3-Dichloropropane	0.2 LT	0.2 LT	0.2 LT	0.2 LT	0.2 LT
Dibromochloromethane	0.25 LT	0.25 LT	0.25 LT	0.25 LT	0.25 LT
1,1,2-Trichloroethane	0.33 LT	0.33 LT	0.33 LT	0.33 LT	0.33 LT
2-Chloroethylvinyl Ether	0.5 LT	0.5 LT	0.5 LT	0.5 LT	0.5 LT
Bromoform	0.2 LT	0.2 LT	0.2 LT	0.2 LT	0.2 LT
1,1,2,2-Tetrachloroethane	0.2 LT	0.2 LT	0.2 LT	0.2 LT	0.2 LT
Tetrachloroethene	0.16 LT	0.16 LT	0.16 LT	0.16 LT	0.16 LT
Carbon Disulfide	0.6 ND	0.6 ND	0.6 ND	0.6 ND	0.6 ND
cis-1,3-Dichloropropene	0.6 ND	0.6 ND	0.6 ND	0.6 ND	0.6 ND
trans-1,3-Dichloropropene	0.6 ND	0.6 ND	0.6 ND	0.6 ND	0.6 ND
WATER SOLUBLES					
Acetone	3.3 LT	3.3 LT	3.3 LT	3.3 LT	3.3 LT
2-Butanone	4.3 LT	4.3 LT	4.3 LT	4.3 LT	4.3 LT
4-Methyl-2-Pentanone	0.63 LT	0.63 LT	0.63 LT	0.63 LT	0.63 LT
2-Hexanone	1 ND	1 ND	1 ND	1 ND	1 ND
OTHER					
Acrylonitrile	2 LT	2 LT	2 LT	2 LT	2 LT
Trichlorofluoromethane	0.23 LT	0.23 LT	0.23 LT	0.23 LT	0.23 LT
Vinyl Acetate	1 ND	1 ND	1 ND	1 ND	1 ND
TOTAL VOC	0	0	0	0	0
TOTAL PETROLEUM HYDROCARBONS	10 LT	10 LT	10 LT	10 LT	10 LT
Collection Date	21-Jan-94	21-Jan-94	21-Jan-94	21-Jan-94	21-Jan-94
Extraction Date	25-Jan-94	25-Jan-94	25-Jan-94	25-Jan-94	25-Jan-94
Analysis Date	29-Jan-94	29-Jan-94	29-Jan-94	29-Jan-94	29-Jan-94

Notes:
(1) LT - less than detection limit; ND - not detected
(2) ft bgs - feet below ground surface

TABLE HHA-9: Semivolatile Organic Compounds in Sediment from the HHA
Fort George G. Meade, Maryland
Page 1 of 2

Site ID	HHASE-1	HHASE-2	HHASE-3	HHASE-4	94QC-402
Field Sample ID	H1D0001A	H1D0002A	H1D0003A	H1D0004A	Q1DD402A
Site Type	STRM	STRM	STRM	STRM	STRM
Start Depth (ft bgs)	0	0	0	0	0
End Depth (ft bgs)	0.5	0.5	0.5	0.5	0.5
Media	CSE	CSE	CSE	CSE	CSE
QC Type					Dup of HHASE-4
SEMIVOLATILE ORGANIC COMPOUNDS (ug/g)					
CHLORINATED MONOCYCLIC AROMATICS					
1,3-Dichlorobenzene	0.042 LT	0.042 LT	0.042 LT	0.042 LT	0.042 LT
1,4-Dichlorobenzene	0.034 LT	0.034 LT	0.034 LT	0.034 LT	0.034 LT
1,2-Dichlorobenzene	0.042 LT	0.042 LT	0.042 LT	0.042 LT	0.042 LT
1,2,4-Trichlorobenzene	0.22 LT	0.22 LT	0.22 LT	0.22 LT	0.22 LT
1,2,3-Trichlorobenzene	0.032 LT	0.032 LT	0.032 LT	0.032 LT	0.032 LT
Hexachlorobenzene	0.08 LT	0.08 LT	0.08 LT	0.08 LT	0.08 LT
NITROSAMINES					
N-Nitroso dimethylamine	0.46 LT	0.46 LT	0.46 LT	0.46 LT	0.46 LT
N-Nitroso-Di-n-Propylamine	1.1 LT	1.1 LT	1.1 LT	1.1 LT	1.1 LT
N-Nitroso diphenylamine	0.29 LT	0.29 LT	0.29 LT	0.29 LT	0.29 LT
NITROMONOCYCLIC AROMATICS					
Nitrobenzene	1.8 LT	1.8 LT	1.8 LT	1.8 LT	1.8 LT
3-Nitrotoluene	0.34 LT	0.34 LT	0.34 LT	0.34 LT	0.34 LT
2,6-Dinitrotoluene	0.32 LT	0.32 LT	0.32 LT	0.32 LT	0.32 LT
2,4-Dinitrotoluene	1.4 LT	1.4 LT	1.4 LT	1.4 LT	1.4 LT
PHENOLS					
Phenol	0.052 LT	0.052 LT	0.052 LT	0.052 LT	0.052 LT
2-Chlorophenol	0.055 LT	0.055 LT	0.055 LT	0.055 LT	0.055 LT
2-Methyl Phenol	0.098 LT	0.098 LT	0.098 LT	0.098 LT	0.098 LT
4-Methyl Phenol	0.24 LT	0.24 LT	0.24 LT	0.24 LT	0.24 LT
2-Nitrophenol	1.1 LT	1.1 LT	1.1 LT	1.1 LT	1.1 LT
2,4-Dimethylphenol	3 LT	3 LT	3 LT	3 LT	3 LT
2,4-Dichlorophenol	0.065 LT	0.065 LT	0.065 LT	0.065 LT	0.065 LT
p-Chloro-m-cresol (4-Chloro-3-methylphenol)	0.93 LT	0.93 LT	0.93 LT	0.93 LT	0.93 LT
2,4,6-Trichlorophenol	0.061 LT	0.061 LT	0.061 LT	0.061 LT	0.061 LT
2,4,5-Trichlorophenol	0.49 LT	0.49 LT	0.49 LT	0.49 LT	0.49 LT
2,3,6-Trichlorophenol	0.62 LT	0.62 LT	0.62 LT	0.62 LT	0.62 LT
2,4-Dinitrophenol	4.7 LT	4.7 LT	4.7 LT	4.7 LT	4.7 LT
4-Nitrophenol	3.3 LT	3.3 LT	3.3 LT	3.3 LT	3.3 LT
Methyl-4,6-Dinitrophenol	0.8 LT	0.8 LT	0.8 LT	0.8 LT	0.8 LT
Dibenzofuran	0.38 LT	0.38 LT	0.38 LT	0.38 LT	0.38 LT
Pentachlorophenol	0.76 LT	0.76 LT	0.76 LT	0.76 LT	0.76 LT
PHOSPHOROUS CONTAINING					
Dimethyl methylphosphonate	NA	NA	NA	NA	NA
Diisopropyl methylphosphonate	NA	NA	NA	NA	NA
PCB's					
PCB-1016	0.32 LT	0.32 LT	0.32 LT	0.32 LT	0.32 LT
PCB-1221	0.32 ND	0.32 ND	0.32 ND	0.32 ND	0.32 ND
PCB-1232	0.32 ND	0.32 ND	0.32 ND	0.32 ND	0.32 ND
PCB-1242	0.32 ND	0.32 ND	0.32 ND	0.32 ND	0.32 ND
PCB-1248	0.32 ND	0.32 ND	0.32 ND	0.32 ND	0.32 ND
PCB-1254	0.32 ND	0.32 ND	0.32 ND	0.32 ND	0.32 ND
PCB-1260	0.79 LT	0.79 LT	0.79 LT	0.79 LT	0.79 LT
PCB-1262	6.3 LT	6.3 LT	6.3 LT	6.3 LT	6.3 LT
PHTHALATES					
Dimethyl Phthalate	0.063 LT	0.063 LT	0.063 LT	0.063 LT	0.063 LT
Diethyl Phthalate	0.24 LT	0.24 LT	0.24 LT	0.24 LT	0.24 LT
Di-n-butyl Phthalate	5.5	1.3 LT	1.3 LT	1.3 LT	1.3 LT
Butyl Benzyl Phthalate	1.8 LT	1.8 LT	1.8 LT	1.8 LT	1.8 LT
Bis (2-Ethyl hexyl) Phthalate	0.48 LT	0.48 LT	0.48 LT	0.48 LT	0.48 LT
Di-n-octyl Phthalate	0.23 LT	0.23 LT	0.23 LT	0.23 LT	0.23 LT
POLYNUCLEAR AROMATICS					
Naphthalene	0.74 LT	0.74 LT	0.74 LT	0.74 LT	0.74 LT
2-Methylnaphthalene	0.032 LT	0.032 LT	0.032 LT	0.032 LT	0.032 LT
2-Chloronaphthalene	0.24 LT	0.24 LT	0.24 LT	0.24 LT	0.24 LT
Acenaphthylene	0.033 LT	0.033 LT	0.033 LT	0.033 LT	0.033 LT
Acenaphthene	0.041 LT	0.041 LT	0.041 LT	0.041 LT	0.041 LT
Fluorene	0.065 LT	0.065 LT	0.065 LT	0.065 LT	0.065 LT
Phenanthrene	0.032 LT	0.032 LT	0.032 LT	0.032 LT	0.032 LT
Anthracene	0.71 LT	0.71 LT	0.71 LT	0.71 LT	0.71 LT
Fluoranthrene	0.09	0.032 LT	0.032 LT	0.062	0.032 LT
Pyrene	0.083 LT	0.083 LT	0.083 LT	0.083 LT	0.083 LT

TABLE HHA-9: Semivolatile Organic Compounds in Sediment from the HHA
Fort George G. Meade, Maryland

Site ID	HHASE-1	HHASE-2	HHASE-3	HHASE-4	94QC-402
Field Sample ID	H1D0001A	H1D0002A	H1D0003A	H1D0004A	Q1DD402A
Site Type	STRM	STRM	STRM	STRM	STRM
Start Depth (ft bgs)	0	0	0	0	0
End Depth (ft bgs)	0.5	0.5	0.5	0.5	0.5
Media	CSE	CSE	CSE	CSE	CSE
QC Type					Dup. of HHASE-4
POLYNUCLEAR AROMATICS					
Benzo (a) Anthracene	0.041 LT	0.041 LT	0.041 LT	0.041 LT	0.041 LT
Chrysene	0.032 LT	0.032 LT	0.032 LT	0.032 LT	0.032 LT
Benzo (b) Fluoranthene	0.31 LT	0.31 LT	0.31 LT	0.31 LT	0.31 LT
Benzo (k) Fluoranthene	0.13 LT	0.13 LT	0.13 LT	0.13 LT	0.13 LT
Benzo (a) Pyrene	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT
Indeno (1,2,3,cd) Pyrene	2.4 LT	2.4 LT	2.4 LT	2.4 LT	2.4 LT
Dibenzo (a,h) Anthracene	0.31 LT	0.31 LT	0.31 LT	0.31 LT	0.31 LT
Benzo (ghi) Perylene	0.18 LT	0.18 LT	0.18 LT	0.18 LT	0.18 LT
PESTICIDES					
Alpha-BHC	1.3 LT	1.3 LT	1.3 LT	1.3 LT	1.3 LT
Beta-BHC	1.3 LT	1.3 LT	1.3 LT	1.3 LT	1.3 LT
Atrazine	0.065 LT	0.065 LT	0.065 LT	0.065 LT	0.065 LT
Lindane (g-BHC)	0.1 LT	0.1 LT	0.1 LT	0.1 LT	0.1 LT
Delta-BHC	0.21 LT	0.21 LT	0.21 LT	0.21 LT	0.21 LT
Heptachlor	0.24 LT	0.24 LT	0.24 LT	0.24 LT	0.24 LT
Bromacil	NA	NA	NA	NA	NA
Malathion	0.18 LT	0.18 LT	0.18 LT	0.18 LT	0.18 LT
Parathion	1.7 LT	1.7 LT	1.7 LT	1.7 LT	1.7 LT
Aldrin	1.3 LT	1.3 LT	1.3 LT	1.3 LT	1.3 LT
Supona	0.92 LT	0.92 LT	0.92 LT	0.92 LT	0.92 LT
Isodrin	0.48 LT	0.48 LT	0.48 LT	0.48 LT	0.48 LT
Heptachlor Epoxide	0.48 LT	0.48 LT	0.48 LT	0.48 LT	0.48 LT
Chlordane	0.68 LT	0.68 LT	0.68 LT	0.68 LT	0.68 LT
Vapona	0.068 LT	0.068 LT	0.068 LT	0.068 LT	0.068 LT
Endosulfan I	0.4 LT	0.4 LT	0.4 LT	0.4 LT	0.4 LT
4,4'DDE	0.068 LT	0.068 LT	0.068 LT	0.068 LT	0.068 LT
Dieldrin	0.079 LT	0.079 LT	0.079 LT	0.079 LT	0.079 LT
Endrin Aldehyde	1.8 LT	1.8 LT	1.8 LT	1.8 LT	1.8 LT
Endrine	1.3 LT	1.3 LT	1.3 LT	1.3 LT	1.3 LT
4,4'-DDD	0.064 LT	0.064 LT	0.064 LT	0.064 LT	0.064 LT
Endosulfan II	2.4 LT	2.4 LT	2.4 LT	2.4 LT	2.4 LT
4,4'-DDT	0.1 LT	0.1 LT	0.1 LT	0.1 LT	0.1 LT
Endosulfan Sulfate	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT
Methoxychlor	0.26 LT	0.26 LT	0.26 LT	0.26 LT	0.26 LT
Mirex	0.14 LT	0.14 LT	0.14 LT	0.14 LT	0.14 LT
Endrine Ketone	0.28 ND	0.28 ND	0.28 ND	0.28 ND	0.28 ND
Toxaphene	12 LT	12 LT	12 LT	12 LT	12 LT
SULFUR CONTAINING					
p-Chlorophenylmethyl Sulfoxide	0.32 LT	0.32 LT	0.32 LT	0.32 LT	0.32 LT
p-Chlorophenylmethyl Sulfide	0.097 LT	0.097 LT	0.097 LT	0.097 LT	0.097 LT
4-Chlorophenylmethyl Sulfone	0.066 LT	0.066 LT	0.066 LT	0.066 LT	0.066 LT
OTHER					
1,4-Oxathaine (Thioxane)	0.075 LT	0.075 LT	0.075 LT	0.075 LT	0.075 LT
Bis (2-Chloroethyl) Ether	0.36 LT	0.36 LT	0.36 LT	0.36 LT	0.36 LT
Dicyclopentadiene	0.57 LT	0.57 LT	0.57 LT	0.57 LT	0.57 LT
Benzyl Alcohol	0.032 LT	0.032 LT	0.032 LT	0.032 LT	0.032 LT
Bis (2-Chloroisopropyl) Ether	0.44 LT	0.44 LT	0.44 LT	0.44 LT	0.44 LT
Dithiane	0.065 LT	0.065 LT	0.065 LT	0.065 LT	0.065 LT
Hexachloroethane	1.8 LT	1.8 LT	1.8 LT	1.8 LT	1.8 LT
Dibromochloropropane	0.071 LT	0.071 LT	0.071 LT	0.071 LT	0.071 LT
Isophorone	0.39 LT	0.39 LT	0.39 LT	0.39 LT	0.39 LT
Bis (2-Chloroethoxy) Methane	0.19 LT	0.19 LT	0.19 LT	0.19 LT	0.19 LT
Benzoic Acid	3.1 ND	3.1 ND	3.1 ND	3.1 ND	3.1 ND
4-Chloroaniline	0.63 ND	0.63 ND	0.63 ND	0.63 ND	0.63 ND
Hexachlorobutadiene	0.97 LT	0.97 LT	0.97 LT	0.97 LT	0.97 LT
2-Nitroniline	3.1 ND	3.1 ND	3.1 ND	3.1 ND	3.1 ND
3-Nitroaniline	3 LT	3 LT	3 LT	3 LT	3 LT
4-Nitroaniline	3.1 ND	3.1 ND	3.1 ND	3.1 ND	3.1 ND
4-Chlorophenyl Phenyl Ether	0.17 LT	0.17 LT	0.17 LT	0.17 LT	0.17 LT
1,2-Diphenyl Hydrazine	0.52 LT	0.52 LT	0.52 LT	0.52 LT	0.52 LT
2,6-Dinitroaniline	0.57 LT	0.57 LT	0.57 LT	0.57 LT	0.57 LT
4-Bromophenyl Phenyl Ether	0.041 LT	0.041 LT	0.041 LT	0.041 LT	0.041 LT
3,5-Dinitroaniline	1.6 LT	1.6 LT	1.6 LT	1.6 LT	1.6 LT
Hexachlorocyclopentadiene	0.52 LT	0.52 LT	0.52 LT	0.52 LT	0.52 LT
3,3'-Dichlorobenzidine	1.6 LT	1.6 LT	1.6 LT	1.6 LT	1.6 LT
TOTAL SVOC	5.6	0	0	0.062	0
Collection Date	21-Jan-94	21-Jan-94	21-Jan-94	21-Jan-94	21-Jan-94
Extraction Date	26-Jan-94	26-Jan-94	26-Jan-94	26-Jan-94	26-Jan-94
Analysis Date	03-Feb-94	03-Feb-94	03-Feb-94	03-Feb-94	03-Feb-94

Notes:
(1) LT - less than detection limit; ND - not detected
(2) ft bgs - feet below ground surface

TABLE HHA-10: Metals in Sediment from the HHA
Fort George G. Meade, Maryland
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Site ID	HHASE-1		HHASE-2		HHASE-3		HHASE-4		94QC-402	
Field Sample ID	H1D0001A		H1D0002A		H1D0003A		H1D0004A		Q1DD402A	
Site Type	STRM		STRM		STRM		STRM		STRM	
Start Depth (ft bgs)	0		0		0		0		0	
End Depth (ft bgs)	0.5		0.5		0.5		0.5		0.5	
Media	CSE		CSE		CSE		CSE		CSE	
Total/Dissolved	Total		Total		Total		Total		Total	
QC Type									Dup. of HHASE-4	
METALS (ug/g)										
Aluminum	15700		1070		1160		2670		3200	
Antimony	19.6	LT	19.6	LT	19.6	LT	19.6	LT	19.6	LT
Arsenic	2.5	LT	2.5	LT	2.5	LT	2.5	LT	2.5	LT
Barium	110		6.78		7.89		20		22.9	
Beryllium	1.17		0.427	LT	0.427	LT	0.427	LT	0.427	LT
Boron	6.64	LT	6.64	LT	6.64	LT	6.64	LT	6.64	LT
Cadmium	1.2	LT	1.2	LT	1.2	LT	1.2	LT	1.2	LT
Calcium	1280		315		136		332		382	
Chromium	24.4		3.07		2.87		6.52		8.32	
Cobalt	14.2		4.45		2.5	LT	3.91		3.89	
Copper	12.4		2.84	LT	2.84	LT	2.84	LT	2.84	LT
Iron	20600		4050		1870		6380		7200	
Lead	10.6		2.8		1.66		3.88		4.46	
Magnesium	3000		220		228		826		838	
Manganese	327		32.3		52.2		90.5		103	
Mercury	0.05	LT	0.05	LT	0.05	LT	0.05	LT	0.05	LT
Molybdenum	14.3	LT	14.3	LT	14.3	LT	14.3	LT	14.3	LT
Nickel	15.9		2.74	LT	2.74	LT	3.56		4.49	
Potassium	1830		131	LT	245		532		558	
Selenium	0.449	LT	0.449	LT	0.449	LT	0.449	LT	0.449	LT
Silver	0.803	LT	0.803	LT	0.803	LT	0.803	LT	0.803	LT
Sodium	106		108		62.3		38.7	LT	38.7	LT
Tellurium	14.9	LT	14.9	LT	14.9	LT	14.9	LT	14.9	LT
Thallium	34.3	LT	34.3	LT	34.3	LT	34.3	LT	34.3	LT
Tin	7.43	LT	7.43	LT	7.43	LT	7.43	LT	7.43	LT
Vanadium	32.8		4.56		4.7		7.51		9.23	
Zinc	62.5		12.3		5.75		19.5		22.3	
Heavy Metals	52		6		5		14		17	
Grand Total Metals	43127		5829		3776		10895		12357	
Collection Date	21-Jan-94		21-Jan-94		21-Jan-94		21-Jan-94		21-Jan-94	
Extraction Date	03-Feb-94		03-Feb-94		03-Feb-94		03-Feb-94		03-Feb-94	
Analysis Date	12-Feb-94		12-Feb-94		12-Feb-94		12-Feb-94		12-Feb-94	

Notes:
(1) LT - less than detection limit; ND - not detected
(2) ft bgs - feet below ground surface
(3) Heavy metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag

Appendix K: Inactive Landfill #2 Analytical Results

Note: The term "LT" indicates that a certified analyte is not detected. The term "ND" is used for analytes that are added to certified methods but have not gone through the certification process. The term "LT" is followed by the certified reporting limit, it does not signify that a compound was actually detected but not included because results were below the Contract Required Detection Limit.

Appendix K: Inactive Landfill #2 Analytical Results

Table IL2-1: Field Screening and Metals Data for Ground Water from the IL2

TABLE IL2-1: Field Screening and Metals Data for Ground Water from the IL2
Forge George G. Meade, Maryland
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Sample Location Identification	MW-27	MW-27	MW-28	MW-28	MW-29	MW-29	MW-30D	MW-30D
Field Sample ID	I1M0027Y	I1M0027Z	I1M0028Y	I1M0028Z	I1M0029Y	I1M0029Z	I1M030DY	I1M030DZ
Site Type	WELL	WELL	WELL	WELL	WELL	WELL	WELL	WELL
Screen Start Depth (ft bgs)	15	15	12(2)	12(2)	10	10	120	120
Screen End Depth (ft bgs)	30	30	22(2)	22(2)	25	25	130	130
Media	CGW	CGW	CGW	CGW	CGW	CGW	CGW	CGW
Total/Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
QC Type								
FIELD PARAMETERS								
pH	5.64		5.43		6.41		5.89	
Conductivity (umhos/cm2)	0.161		0.144		0.827		0.107	
Temperature (C)	12.4		10.4		8.1		13.3	
Turbidity (NTU)	10		>999		>999		799	
METALS (ug/L)								
Aluminum	481	112 LT	3490	112 LT	19900	112 LT	2790	271
Antimony	60 LT	60 LT	60 LT	60 LT	60 LT	60 LT	60 LT	60 LT
Arsenic	6.09	2.35 LT	7.56	2.35 LT	12	9.9	2.35 LT	2.35 LT
Barium	50.8	46.9	84.8	62.1	480	309	105	204
Beryllium	1.12 LT	1.12 LT	1.17	1.12 LT	3.54	1.12 LT	1.75	1.12 LT
Boron	230 LT	230 LT	230 LT	230 LT	298	274	230 LT	230 LT
Cadmium	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT
Calcium	18300	18500	13500	12900	102000	95700	33100	79100
Chromium	16.8 LT	16.8 LT	24.6	16.8 LT	85.7	16.8 LT	38.8	18
Cobalt	25 LT	25 LT	25 LT	25 LT	58	29.8	25 LT	25 LT
Copper	18.8 LT	18.8 LT	33.1	18.8 LT	123	18.8 LT	18.8 LT	18.8 LT
Iron	22600	12300	25800	366	132000	43800	25900	92.8
Lead	15.4	4.47 LT	11.1	4.47 LT	78.5	4.47 LT	10.7	4.47 LT
Magnesium	4720	4710	5540	4890	17700	15900	357	135 LT
Manganese	682	685	342	316	3560	2600	55.8	9.67 LT
Mercury	0.1 LT	0.1 LT	0.1 LT	0.1 LT	0.512	0.1 LT	0.1 LT	0.1 LT
Molybdenum	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT
Nickel	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT
Potassium	2610	2500	3620	2890	15600	14000	24000	62300
Selenium	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT
Silver	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT
Sodium	2230	2250	4760	4440	5650	5460	26400	72000
Tellurium	118 LT	118 LT	118 LT	118 LT	118 LT	118 LT	118 LT	118 LT
Thallium	125 LT	125 LT	125 LT	125 LT	125 LT	125 LT	125 LT	125 LT
Tin	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT
Vanadium	27.6 LT	27.6 LT	48.6	27.6 LT	118	27.6 LT	63.4	27.6 LT
Zinc	31.3	18 LT	32.9	18 LT	135	18 LT	38.2	18 LT
TOTAL HEAVY METALS(1)	**21**	**0**	**44**	**0**	**180**	**10**	**51**	**18**
TOTAL METALS	**51727**	**40992**	**57296**	**25864**	**297802**	**178083**	**112861**	**213986**
Collection Date:	17-Feb-93	17-Feb-93	17-Feb-93	17-Feb-93	17-Feb-93	17-Feb-93	17-Feb-93	17-Feb-93

NOTES:
(1) = Heavy Metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag; LT= Less than detection limits; ND= Not detected
(2) Depth based on total depth measurement assuming a 10-ft screen and a 2.5-ft stick-up (no well log available)

TABLE IL2-1: Field Screening and Metals Data for Ground Water from the IL2
Forge George G. Meade, Maryland
Page 2 of 2

Sample Location Identification	93QC-451	93QC-451	MW-30S	MW-30S	MW-31	MW-31	93QC-150	93QC-250
Field Sample ID	Q1MD451Y	Q1MD451Z	I1M030SY	I1M030SZ	I1M0031Y	I1M0031Z	Q1XF150Y	Q1XR250Y
Site Type	WELL	WELL	WELL	WELL	WELL	WELL	FBLK	RNSW
Screen Start Depth (ft bgs)	120	120	15	15	12.5	12.5	-	-
Screen End Depth (ft bgs)	130	130	30	30	27.5	27.5	-	-
Media	CGW	CGW	CGW	CGW	CGW	CGW	CSW	CSW
Total/Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Total
QC Type	Dup of MW-30D						Field Blank	Rinse Water
FIELD PARAMETERS								
pH			6.2		6.62		NA	NA
Conductivity (umhos/cm2)			0.233		0.099		NA	NA
Temperature (C)			11.8		11.2		NA	NA
Turbidity (NTU)			>999		>999		NA	NA
METALS (ug/L)								
Aluminum	1610	357	24800	112 LT	8360	112 LT	112 LT	112 LT
Antimony	60 LT	60 LT	60 LT	60 LT	60 LT	60 LT	60 LT	60 LT
Arsenic	2.35 LT	2.35 LT	7.75	2.35 LT	40.3	18.1	2.35 LT	2.35 LT
Barium	399	396	286	65.6	158	89.1	2.82 LT	2.82 LT
Beryllium	1.41	1.12 LT	3.89	1.12 LT	3.7	1.12 LT	1.12 LT	1.12 LT
Boron	230 LT	230 LT	230 LT	230 LT	444	466	230 LT	230 LT
Cadmium	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT
Calcium	148000	157000	36800	30300	147000	144000	105 LT	105 LT
Chromium	38.1	26.7	203	16.8 LT	96.8	16.8 LT	16.8 LT	16.8 LT
Cobalt	25 LT	25 LT	83.2	25 LT	52.6	25 LT	25 LT	25 LT
Copper	18.8 LT	18.8 LT	198	18.8 LT	76.3	18.8 LT	18.8 LT	18.8 LT
Iron	14800	77.5 LT	146000	5440	98200	18000	77.5 LT	77.5 LT
Lead	5.43	4.47 LT	173	4.47 LT	47.6	4.47 LT	26.1	4.47 LT
Magnesium	162	135 LT	7830	5920	26800	25700	135 LT	135 LT
Manganese	28.1	9.67 LT	1910	1270	2200	1950	9.67 LT	9.67 LT
Mercury	0.1 LT	0.1 LT	0.47	0.1 LT	0.106	0.1 LT	0.1 LT	0.1 LT
Molybdenum	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT
Nickel	32.1 LT	32.1 LT	62.5	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT
Potassium	105000	113000	9050	5250	15800	14700	1240 LT	1240 LT
Selenium	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT
Silver	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT
Sodium	130000	130000	3420	3300	10200	10100	279 LT	279 LT
Tellurium	118 LT	118 LT	118 LT	118 LT	118 LT	118 LT	118 LT	118 LT
Thallium	125 LT	125 LT	125 LT	125 LT	125 LT	125 LT	125 LT	125 LT
Tin	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT
Vanadium	30.6	27.6 LT	310	27.6 LT	236	27.6 LT	27.6 LT	27.6 LT
Zinc	18 LT	47.7	295	18 LT	64.8	18 LT	18 LT	18 LT
TOTAL HEAVY METALS(1)	**45**	**27**	**451**	**0**	**189**	**18**	**26**	**0**
TOTAL METALS	**400075**	**400827**	**231433**	**51546**	**309780**	**215023**	**26**	**0**
Collection Date:	17-Feb-93	17-Feb-93	17-Feb-93	17-Feb-93	17-Feb-93	17-Feb-93	17-Feb-93	17-Feb-93

NOTES:
(1) = Heavy Metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag; LT= Less than detection limits; ND= Not detected
(2) Depth based on total depth measurement assuming a 10-ft screen and a 2.5-ft stick-up (no well log available)

Appendix L: Ordnance Demolition Area Analytical Results

Note: The term "LT" indicates that a certified analyte is not detected. The term "ND" is used for analytes that are added to certified methods but have not gone through the certification process. The term "LT" is followed by the certified reporting limit, it does not signify that a compound was actually detected but not included because results were below the Contract Required Detection Limit.

TABLE ODA-1: Explosives Data for Soil from the ODA
Fort George G. Meade, Maryland

Sample Location ID	ODAMW-1		ODAMW-1		ODAMW-1		ODAMW-2		ODAMW-2		ODAMW-2		ODAMW-3		ODAMW-3		ODAMW-3	
Field Sample ID	O1B0001A		O1B0001B		O1B0001C		O1B0002A		O1B0002B		O1B0002C		O1B0003A		O1B0003B		O1B0003C	
Site Type	BORE		BORE		BORE		BORE		BORE		BORE		BORE		BORE		BORE	
Start Depth (ft bgs)	0		5		10		0		5		10		0		5		10	
End Depth (ft bgs)	2		7		12		2		7		12		2		7		12	
Media	CSO		CSO		CSO		CSO		CSO		CSO		CSO		CSO		CSO	
Total/Dissolved	Total		Total		Total		Total		Total		Total		Total		Total		Total	
QC Type																		
EXPLOSIVES (ug/g)																		
HMX	2	LT	2	LT	2	LT	2	LT	2	LT	2	LT	2	LT	2	LT	2	LT
RDX	1.28	LT	1.28	LT	1.28	LT	1.28	LT	1.28	LT	1.28	LT	1.28	LT	1.28	LT	1.28	LT
1,3,5-Trinitrobenzene	0.922	LT	0.922	LT	0.922	LT	0.922	LT	0.922	LT	0.922	LT	0.922	LT	0.922	LT	0.922	LT
1,3-Dinitrobenzene	0.504	LT	0.504	LT	0.504	LT	0.504	LT	0.504	LT	0.504	LT	0.504	LT	0.504	LT	0.504	LT
Nitrobenzene	1.14	LT	1.14	LT	1.14	LT	1.14	LT	1.14	LT	1.14	LT	1.14	LT	1.14	LT	1.14	LT
2,4,6-Trinitrotoluene	2	LT	2	LT	2	LT	2	LT	2	LT	2	LT	2	LT	2	LT	2	LT
Tetryl	2.11	LT	2.11	LT	2.11	LT	2.11	LT	2.11	LT	2.11	LT	2.11	LT	2.11	LT	2.11	LT
2,4-Dinitrotoluene	2.5	LT	2.5	LT	2.5	LT	2.5	LT	2.5	LT	2.5	LT	2.5	LT	2.5	LT	2.5	LT
2,6-Dinitrotoluene	2	LT	2	LT	2	LT	2	LT	2	LT	2	LT	2	LT	2	LT	2	LT
Collection Date:	22-Jan-93		22-Jan-93		22-Jan-93		25-Jan-93		25-Jan-93		25-Jan-93		26-Jan-93		26-Jan-93		26-Jan-93	
Extraction Date:	23-Feb-93		23-Feb-93		23-Feb-93		23-Feb-93		23-Feb-93		23-Feb-93		23-Feb-93		23-Feb-93		23-Feb-93	
Analysis Date:	25-Feb-93		25-Feb-93		25-Feb-93		25-Feb-93		25-Feb-93		25-Feb-93		25-Feb-93		23-Feb-93		23-Feb-93	

NOTES:
(1) LT= Less than detection limits

TABLE ODA-1: Explosives Data for Soil from the ODA
Fort George G. Meade, Maryland

Sample Location ID	ODASB-4	ODASB-4	93QC-100	93QC-101	93QC-102	93QC-200	93QC-201	93QC-202
Field Sample ID	O1B0004A	O1B0004B	Q1XF100Y	Q1XF101Y	Q1XF102Y	Q1XR200Y	Q1XR201Y	Q1XR202Y
Site Type	BORE	BORE	FBLK	FBLK	FBLK	RNSW	RNSW	RNSW
Start Depth (ft bgs)	0	5	-	-	-	-	-	-
End Depth (ft bgs)	2	7	-	-	-	-	-	-
Media	CSO	CSO	CSW	CSW	CSW	CSW	CSW	CSW
Total/Dissolved	Total	Total	Total	Total	Total	Total	Total	Total
QC Type			Field Blank	Field Blank	Field Blank	Rinse Water	Rinse Water	Rinse Water
EXPLOSIVES (ug/g)								
HMX	2 LT	2 LT	0.53 LT	0.53 LT	0.53 LT	0.53 LT	0.53 LT	0.53 LT
RDX	1.28 LT	1.28 LT	0.42 LT	0.42 LT	0.42 LT	0.42 LT	0.42 LT	0.42 LT
1,3,5-Trinitrobenzene	0.922 LT	0.922 LT	0.21 LT	0.68	0.7	1.96	0.21 LT	0.28
1,3-Dinitrobenzene	0.504 LT	0.504 LT	0.46 LT	0.46 LT	0.46 LT	0.46 LT	0.46 LT	0.46 LT
Nitrobenzene	1.14 LT	1.14 LT	0.68 LT	0.68 LT	0.68 LT	0.68 LT	0.68 LT	0.68 LT
2,4,6-Trinitrotoluene	2 LT	2 LT	0.43 LT	0.43 LT	0.43 LT	0.43 LT	0.43 LT	0.43 LT
Tetryl	2.11 LT	2.11 LT	0.63 LT	0.63 LT	0.63 LT	0.63 LT	0.63 LT	0.63 LT
2,4-Dinitrotoluene	2.5 LT	2.5 LT	0.4 LT	0.4 LT	0.4 LT	0.4 LT	0.4 LT	0.4 LT
2,6-Dinitrotoluene	2 LT	2 LT	0.6 LT	0.6 LT	0.6 LT	0.6 LT	0.6 LT	0.6 LT
Collection Date:	26-Jan-93	26-Jan-93	22-Jan-93	25-Jan-93	26-Jan-93	22-Jan-93	25-Jan-93	26-Jan-93
Extraction Date:	23-Feb-93	23-Feb-93	26-Jan-93	26-Jan-93	01-Feb-93	26-Jan-93	26-Jan-93	01-Feb-93
Analysis Date:	25-Feb-93	25-Feb-93	13-Feb-93	13-Feb-93	13-Feb-93	13-Feb-93	13-Feb-93	13-Feb-93

NOTES:
(1) LT= Less than detection limits

TABLE ODA-2: Metals Data for Soil from the ODA
Fort George G. Meade, Maryland
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Sample Location ID	ODAMW-1	ODAMW-1	ODAMW-1	ODAMW-2	ODAMW-2	ODAMW-2	ODAMW-3	ODAMW-3	ODAMW-3
Field Sample ID	O1B0001A	O1B0001B	O1B0001C	O1B0002A	O1B0002B	O1B0002C	O1B0003A	O1B0003B	O1B0003C
Site Type	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE
Start Depth (ft bgs)	0	5	10	0	5	10	0	5	10
End Depth (ft bgs)	2	7	12	2	7	12	2	7	12
Media	CSO	CSO	CSO	CSO	CSO	CSO	CSO	CSO	CSO
Total/Dissolved	Total	Total	Total	Total	Total	Total	Total	Total	Total
QC Type									
METALS (ug/g)									
Aluminum	2990	5110	1290	9860	6060	1910	6920	6430	2780
Antimony	19.6 LT	19.6 LT	19.6 LT	19.6 LT	19.6 LT	19.6 LT	19.6 LT	19.6 LT	19.6 LT
Arsenic	4.38	2.5 LT	3.38	6.31	2.5 LT	2.5 LT	2.5 LT	8.28	4.24
Barium	9.74	16.8	5.64	21.1	13.3	5.34	39.8	16.4	8.1
Beryllium	0.427 LT	0.427 LT	0.427 LT	0.427 LT	0.427 LT	0.427 LT	0.427 LT	0.427 LT	0.427 LT
Boron	14	16.2	10.8	11.2	15	13.6	9.76	14.4	14.9
Cadmium	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT
Calcium	115	66.9	25.3 LT	150	33.9	25.3 LT	157	31.2	25.3 LT
Chromium	12	11.4	6.77	14.7	10.5	5.31	19.6	14	7.45
Cobalt	2.5 LT	2.5 LT	2.5 LT	2.5 LT	2.5 LT	2.5 LT	2.5 LT	2.5 LT	2.5 LT
Copper	21.7	6.16	3.9	5.26	4.12	2.84 LT	16.5	5.5	4.54
Iron	9780	3990	4510	7410	7090	3500	8110	10400	4770
Lead	5.15	2.98	1.68	5.73	2.29	1.52	5.47	3.32	2.09
Magnesium	138	150	28.3	445	355	58.8	337	182	69.9
Manganese	16.9	9.87 LT	9.87 LT	19	16.9	9.87 LT	22	9.87 LT	9.87 LT
Mercury	0.5 LT	0.5 LT	0.5 LT	0.5 LT	0.5 LT	0.5 LT	0.5 LT	0.5 LT	0.5 LT
Molybdenum	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT
Nickel	2.74 LT	2.74 LT	2.74 LT	2.74 LT	2.74 LT	2.74 LT	2.74 LT	2.74 LT	2.74 LT
Potassium	211	416	131 LT	605	420	131 LT	405	467	177
Selenium	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT
Silver	0.803 LT	0.803 LT	0.803 LT	0.803 LT	0.803 LT	0.803 LT	0.803 LT	0.803 LT	0.803 LT
Sodium	38.7 LT	38.7 LT	38.7 LT	38.7 LT	38.7 LT	38.7 LT	38.7 LT	38.7 LT	38.7 LT
Tellurium	14.9 LT	14.9 LT	14.9 LT	14.9 LT	14.9 LT	14.9 LT	14.9 LT	14.9 LT	14.9 LT
Thallium	34.3 LT	34.3 LT	34.3 LT	34.3 LT	34.3 LT	34.3 LT	34.3 LT	34.3 LT	34.3 LT
Tin	7.43 LT	7.43 LT	7.43 LT	7.43 LT	7.43 LT	7.43 LT	7.43 LT	7.43 LT	7.43 LT
Vanadium	22.5	13.6	19	22.2	17	11.7	19.8	22.3	14.4
Zinc	11.6	6.74	2.34 LT	11.1	6.12	2.34 LT	14.9	4.51	2.34 LT
HEAVY METALS(2)	22	14	12	27	13	7	25	26	14
TOTAL METALS	13352	9807	5879	18587	14044	5506	16077	17599	7853
Collection Date:	22-Jan-93	22-Jan-93	25-Jan-93	25-Jan-93	25-Jan-93	25-Jan-93	26-Jan-93	26-Jan-93	26-Jan-93
Extraction Date:	23-Feb-93	23-Feb-93	23-Feb-93	23-Feb-93	23-Feb-93	23-Feb-93	23-Feb-93	23-Feb-93	23-Feb-93
Analysis Date:	24-Feb-93	24-Feb-93	24-Feb-93	24-Feb-93	24-Feb-93	24-Feb-93	24-Feb-93	24-Feb-93	24-Feb-93

Notes:
(1) LT = Less than detection limits
(2) Heavy metals include SB,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag

TABLE ODA-2: Metals Data for Soil from the ODA
Fort George G. Meade, Maryland

Sample Location ID	ODASB-4	ODASB-4	93QC-100	93QC-101	93QC-102	93QC-200	93QC-201	93QC-202
Field Sample ID	O1B0004A	O1B0004B	Q1XF100Y	Q1XF101Y	Q1XF102Y	Q1XR200Y	Q1XR201Y	Q1XR202Y
Site Type	BORE	BORE	FBLK	FBLK	FBLK	RNSW	RNSW	RNSW
Start Depth (ft bgs)	0	5	-	-	-	-	-	-
End Depth (ft bgs)	2	7	-	-	-	-	-	-
Media	CSO	CSO	CSW	CSW	CSW	CSW	CSW	CSW
Total/Dissolved	Total	Total	Total	Total	Total	Total	Total	Total
QC Type			Field Blank	Field Blank	Field Blank	Rinse Water	Rinse Water	Rinse Water
METALS (ug/g)								
Aluminum	6820	2750	112 LT	112 LT	112 LT	794	287	112 LT
Antimony	19.6 LT	19.6 LT	60 LT	60 LT	60 LT	60 LT	60 LT	60 LT
Arsenic	3.96	8.76	2.35 LT	2.35 LT	2.35 LT	2.35 LT	2.35 LT	2.35 LT
Barium	49	6.93	2.82 LT	4.73	2.82 LT	5.92	3.55	2.82 LT
Beryllium	0.427 LT	0.427 LT	1.12 LT	1.12 LT	1.12 LT	1.12 LT	1.12 LT	1.12 LT
Boron	12.7	9.49	230 LT	230 LT	230 LT	230 LT	230 LT	230 LT
Cadmium	1.2 LT	1.2 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT
Calcium	25900	100	105 LT	105 LT	105 LT	519	221	105 LT
Chromium	19.4	12.1	16.8 LT	16.8 LT	16.8 LT	35.8	16.8 LT	16.8 LT
Cobalt	4.38	2.5 LT	25 LT(J)	25 LT(J)	25 LT(J)	25 LT(J)	25 LT(J)	25 LT(J)
Copper	47.1	6.26	18.8 LT	18.8 LT	18.8 LT	18.8 LT	18.8 LT	18.8 LT
Iron	12700	8850	77.5 LT	77.5 LT	77.5 LT	7780	2010	147
Lead	260	2.77	4.47 LT	4.47 LT	4.47 LT	8.45	4.47 LT	4.47 LT
Magnesium	5830	85.7	135 LT	135 LT	135 LT	135 LT	135 LT	135 LT
Manganese	155	9.87 LT	9.67 LT	9.67 LT	9.67 LT	67.3	27.1	9.67 LT
Mercury	0.95	0.5 LT	0.1 LT	0.1 LT	0.1 LT	0.1 LT	0.1 LT	0.1 LT
Molybdenum	14.3 LT	14.3 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT
Nickel	11.1	2.74 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT
Potassium	851	227	1240 LT	1240 LT	1240 LT	1240 LT	1240 LT	1240 LT
Selenium	0.449 LT	0.449 LT	4.3	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT
Silver	0.803 LT	0.803 LT	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT
Sodium	132	38.7 LT	279 LT	279 LT	359	306	425	390
Tellurium	14.9 LT	14.9 LT	118 LT	118 LT	118 LT	118 LT	118 LT	118 LT
Thallium	34.3 LT	34.3 LT	125 LT	125 LT	125 LT	125 LT	125 LT	125 LT
Tin	98.3	7.43 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT
Vanadium	22.7	22.1	27.6 LT	27.6 LT	27.6 LT	27.6 LT	27.6 LT	27.6 LT
Zinc	72.9	3.83	18 LT	18 LT	18 LT	18 LT	18 LT	18 LT
HEAVY METALS (2)	295	24	4	0	0	44	0	0
TOTAL METALS	52990	12085	4	5	359	9516	2974	537
Collection Date:	26-Jan-93	26-Jan-93	22-Jan-93	25-Jan-93	26-Jan-93	22-Jan-93	25-Jan-93	26-Jan-93
Extraction Date:	23-Feb-93	23-Feb-93	18-Feb-93	18-Feb-93	18-Feb-93	18-Feb-93	18-Feb-93	18-Feb-93
Analysis Date:	24-Feb-93	24-Feb-93	25-Feb-93	25-Feb-93	25-Feb-93	25-Feb-93	25-Feb-93	25-Feb-93

Notes:
(1) LT = Less than detection limits

TABLE ODA-3: Field Screening and Metals Data for Ground Water from the ODA
Fort George G. Meade, Maryland

Sample Location Identification	ODAMW-1	ODAMW-1	ODAMW-2	ODAMW-2	ODAMW-3	ODAMW-3	93QC-154	93QC-254
Field Sample ID	01M0001Y	01M0001Z	01M0002Y	01M0002Z	01M0003Y	01M0003Z	Q1XF154Y	Q1XR254Y
Site Type	WELL	WELL	WELL	WELL	WELL	WELL	FBLK	RNSW
Screen Start Depth (ft bgs)	3.5	3.5	4	4	5	5	-	-
Screen End Depth (ft bgs)	13.5	13.5	14	14	15	15	-	-
Media	CGW	CGW	CGW	CGW	CGW	CGW	CSW	CSW
Total/Dissovled	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Total
QC Type							Field Blank	Rinse Blank
FIELD PARAMETERS								
pH	4.69		4.19		4.71		NA	NA
Conductivity(umhos/cm2)	0.112		0.108		0.059		NA	NA
Temperature(C)	7.3		7.2		8.9		NA	NA
Turbidity(NTU)	365		0		436		NA	NA
METALS (ug/L)								
Aluminum	1970	580	11800	505	9720	117	112 LT	112 LT
Antimony	60 LT	60 LT	60 LT	60 LT	60 LT	60 LT	60 LT	60 LT
Arsenic	2.77	2.35 LT	4.64	2.35 LT	5.95	2.35 LT	2.35 LT	2.35 LT
Barium	78	81.8	104	88.1	88.7	58.2	2.82 LT	2.82 LT
Beryllium	1.12 LT	1.12 LT	1.34	1.12 LT	1.12 LT	1.12 LT	1.12 LT	1.12 LT
Boron	230 LT	230 LT	230 LT	230 LT	230 LT	230 LT	230 LT	230 LT
Cadmium	7.45	9.01	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT	6.78 LT
Calcium	7420	9520	6480	8170	2040	1970	105 LT	105 LT
Chromium	16.8 LT	16.8 LT	52.7	16.8 LT	42	16.8 LT	16.8 LT	16.8 LT
Cobalt	25 LT	25 LT	25 LT	25 LT	25 LT	25 LT	25 LT	25 LT
Copper	18.8 LT	18.8 LT	30.4	18.8 LT	25.4	18.8 LT	18.8 LT	18.8 LT
Iron	8960	77.5 LT	29800	77.5 LT	34000	77.5 LT	77.5 LT	77.5 LT
Lead	4.47 LT	4.47 LT	6.54	4.47 LT	6.47	4.47 LT	4.47 LT	4.47 LT
Magnesium	3790	4340	4310	5070	3090	2680	135 LT	135 LT
Manganese	218	270	243	284	163	138	9.67 LT	9.67 LT
Mercury	0.1 LT	0.1 LT	0.1 LT	0.1 LT	0.1 LT	0.1 LT	0.1 LT	0.1 LT
Molybdenum	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT	52.7 LT
Nickel	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT	32.1 LT
Potassium	1630	2150	2550	1690	2030	1660	1240 LT	1240 LT
Selenium	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT	2.53 LT
Silver	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT
Sodium	3150	3490	2340	3480	2460	2460	544	450
Tellurium	118 LT	118 LT	118 LT	118 LT	118 LT	118 LT	118 LT	118 LT
Thallium	125 LT	125 LT	125 LT	125 LT	125 LT	125 LT	125 LT	125 LT
Tin	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT	59.9 LT
Vanadium	27.6 LT	27.6 LT	82	27.6 LT	61.9	27.6 LT	27.6 LT	27.6 LT
Zinc	76.6	109	66.4	49.8	45.9	35.3	18 LT	18 LT
Total Heavy Metals (1)	10	9	65	0	54	0	0	0
Total Metals	27303	20550	57871	19337	53779	9119	544	450
Collection Date:	26-Feb-93	26-Feb-93	24-Feb-93	24-Feb-93	26-Feb-93	26-Feb-93	26-Feb-93	26-Feb-93

Notes:
(1) Heavy Metals include SB,AS,BE,CD,CZR,PB,HG,NI,SE,AG; LT = Less than dection limits; ND = Not detected
(2) Extraction and Analysis Dates not given since individual analysis holding times vary

TABLE ODA-4: Explosives Data for Ground Water from the ODA
Fort George G. Meade, Maryland

Sample Location ID	ODAMW-1		ODAMW-2		ODAMW-3		93QC-154		93QC-254	
Field Sample ID	O1M0001		O1M0002		O1M0003		Q1XF154Y		Q1XR254Y	
Site Type	WELL		WELL		WELL		FBLK		RNSW	
Screen Start Depth (ft bgs)	3.5		4		5		-		-	
Screen End Depth (ft bgs)	13.5		14		15		-		-	
Media	CGW		CGW		CGW		CGW		CGW	
Total/Dissolved	Total		Total		Total		Total		Total	
QC Type							Field Blank		Rinse Water	
EXPLOSIVES (ug/L)										
HMX	3.57		9.13		0.533	LT	0.53	LT	0.53	LT
RDX	33.5		84		0.416	LT	0.42	LT	0.42	LT
1,3,5-Trinitrobenzene	0.21	LT	0.21	LT(K)	0.21	LT(K)	0.4		0.77	
1,3-Dinitrobenzene	0.458	LT	0.458	LT	0.458	LT	0.46	LT	0.46	LT
Nitrobenzene	0.682	LT	0.682	LT	0.682	LT	0.68	LT	0.68	LT
2,4,6-Trinitrotoluene	0.426	LT	0.426	LT	0.426	LT	0.43	LT	0.43	LT
Tetryl	0.631	LT	0.631	LT	0.631	LT	0.63	LT	0.63	LT
2,4-Dinitrotoluene	0.599		0.615		0.397	LT	0.4	LT	0.4	LT
2,6-Dinitrotoluene	0.6	LT(K)	0.6	LT(K)	0.6	LT	0.6	LT	0.6	LT
Collection Date:	26-Feb-93		24-Feb-93		26-Feb-93		26-Feb-93		26-Feb-93	
Extraction Date:	01-Mar-93		01-Mar-93		01-Mar-93		01-Mar-93		01-Mar-93	
Analysis Date:	25-Mar-93		25-Mar-93		25-Mar-93		25-Mar-93		25-Mar-93	

NOTES:
(1) LT= Less than detection limits; (K) = Missed Holding Time for Extraction and Preparation

TABLE ODA-5: Volatile Organic Compounds in Ground Water form the ODA
Fort George G. Meade, Maryland

Sample Location Identification	ODAMW-1		ODAMW-2		ODAMW-3		93QC-154		93QC-254	
Field Sample ID	O1M0001		O1M0002		O1M0003		Q1XF154Y		Q1XR254Y	
Site Type	WELL		WELL		WELL		FBLK		RNSW	
Screen Start Depth (ft bgs)	3.5		4		5		-		-	
Screen End Depth (ft bgs)	13.5		14		15		-		-	
Media	CGW		CGW		CGW		CGW		CGW	
Total/Dissolved	Total		Total		Total		Total		Total	
QC Type							Field Blank		Rinse Water	
VOLATILE ORGANIC COMPOUNDS (ug/L)										
AROMATICS										
Benzene	1	LT	1	LT	1	LT	1	LT	1	LT
Toluene	1	LT	1	LT	1	LT	1	LT	1	LT
Chlorobenzene	1	LT	1	LT	1	LT	1	LT	1	LT
Ethylbenzene	1	LT	1	LT	1	LT	1	LT	1	LT
1,3-Dimethylbenzene	1	LT	1	LT	1	LT	1	LT	1	LT
Xylenes	2	LT	2	LT	2	LT	2	LT	2	LT
Dichlorobenzene, Nonspecific	2	LT	2	LT	2	LT	2	LT	2	LT
Styrene	5	ND	5	ND	5	ND	5	ND	5	ND
HALOGENATED ORGANICS										
Chloromethane	1.2	LT	1.2	LT	1.2	LT	1	LT	1	LT
Bromomethane	14	LT	14	LT	14	LT	14	LT	14	LT
Vinyl Chloride	12	LT	12	LT	12	LT	12	LT	12	LT
Chloroethane	8	LT	8	LT	8	LT	8	LT	8	LT
Methylene Chloride	1	LT	1	LT	1	LT	1	LT	1	LT
1,1-Dichloroethene	1	LT	1	LT	1	LT	1	LT	1	LT
1,1-Dichloroethane	1	LT	1	LT	1	LT	1	LT	1	LT
1,2-Dichloroethylenes	5	LT	5	LT	5	LT	5	LT	5	LT
Chloroform	1	LT	1	LT	1	LT	1	LT	1	LT
1,2-Dichloroethane	1	LT	1	LT	1	LT	1	LT	1	LT
1,1,1-Trichloroethane	1	LT	1	LT	1	LT	1	LT	1	LT
Carbon Tetrachloride	1	LT	1	LT	1	LT	1	LT	1	LT
Bromodichloromethane	1	LT	1	LT	1	LT	1	LT	1	LT
1,2-Dichloropropane	1	LT	1	LT	1	LT	8		7	
Trichloroethene	1	LT	1	LT	2.6		1	LT	1	LT
1,3-Dichloropropane	4.8	LT	4.8	LT	4.8	LT	5	LT	5	LT
Dibromochloromethane	1	LT	1	LT	1	LT	1	LT	1	LT
1,1,2-Trichloroethane	1	LT	1	LT	1	LT	1	LT	1	LT
2-Chloroethylvinyl Ether	3.5	LT	3.5	LT	3.5	LT	4	LT	4	LT
Bromoform	11	LT	11	LT	11	LT	11	LT	11	LT
1,1,2,2-Tetrachloroethane	1.5	LT	1.5	LT	1.5	LT	2	LT	2	LT
Tetrachloroethene	5.6		4.5		10		1	LT	1	LT
1,3-Dichlorobenzene	1	LT	1	LT	1	LT	1	LT	1	LT
Carbon Disulfide	5	ND	5	ND	5	ND	5	ND	5	ND
Cis-1,3-Dichloropropene	5	ND	5	ND	5	ND	5	ND	5	ND
Trans-1,3-Dichloropropene	5	ND	5	ND	5	ND	5	ND	5	ND
WATER SOLUBLE										
Acetone	8	LT	8	LT	8	LT	8	LT	8	LT
2-Butanone	10	LT	10	LT	10	LT	10	LT	10	LT
4-Methyl-2-Pentanone	1.4	LT	1.4	LT	1.4	LT	1	LT	1	LT
2-Hexanone	1	ND	1	ND	1	ND	1	ND	1	ND
OTHER										
Acrylonitrile	8.4	LT	8.4	LT	8.4	LT	8	LT	8	LT
Trichlorofluoromethane	1	LT	1	LT	1	LT	1	LT	1	LT
Vinyl Acetate	1	ND	1	ND	1	ND	1	ND	1	ND
TOTAL VOC	**6**		**5**		**13**		**8**		**7**	
Collection Date:	26-Feb-93		24-Feb-93		26-Feb-93		26-Feb-93		26-Feb-93	
Extraction Date:	07-Mar-93		07-Mar-93		07-Mar-93		15-Mar-93		15-Mar-93	
Analysis Date:	07-Mar-93		07-Mar-93		07-Mar-93		16-Mar-93		16-Mar-93	

NOTES:
(1) LT= Less than detection limits; ND= Not detected

TABLE ODA-6: Semivolatile Organic Compounds in Ground Water from the ODA

Fort George G. Meade, Maryland

Sample Location ID	ODAMW-1	ODAMW-2	ODAMW-3	93QC-154
Field Sample ID	O1M0001	O1M0002	O1M0003	Q1XF154Y
Site Type	WELL	WELL	WELL	FBLK
Screen Start Depth (ft bgs)	3.5	4	5	-
Screen End Depth (ft bgs)	13.5	14	15	-
Media	CGW	CGW	CGW	CGW
Total/Dissolved				Total
QC Type				Field Blank
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)				
CHLORONATED MONOCYCLIC AROMATICS				
1,3-Dichlorobenzene	3.4 LT	3.4 LT	3.4 LT	3 LT
1,4-Dichlorobenzene	1.5 LT	1.5 LT	1.5 LT	2 LT
1,2-Dichlorobenzene	1.2 LT	1.2 LT	1.2 LT	1 LT
1,2,4-Trichlorobenzene	2.4 LT	2.4 LT	2.4 LT	2 LT
1,2,3-Trichlorobenzene	5.8 LT	5.8 LT	5.8 LT	6 LT
Hexachlorobenzene	12 LT	12 LT	12 LT	12 LT
NITROSAMINES				
N-Nitroso Dimethylamine	9.7 LT	9.7 LT	9.7 LT	10 LT
N-Nitroso Di-N-Propylamine	6.8 LT	6.8 LT	6.8 LT	7 LT
N-Nitroso Diphenylamine	3.7 LT	3.7 LT	3.7 LT	4 LT
NITROMONOCYCLIC AROMATICS				
Nitrobenzene	3.7 LT	3.7 LT	3.7 LT	4 LT
3-Nitrotoluene	2.9 LT	2.9 LT	2.9 LT	3 LT
2,6-Dinitrotoluene	6.7 LT	6.7 LT	6.7 LT	7 LT
2,4-Dinitrotoluene	5.8 LT	5.8 LT	5.8 LT	6 LT
PHENOLS				
Phenol	2.2 LT	2.2 LT	2.2 LT	2 LT
2-Chlorophenol	2.8 LT	2.8 LT	2.8 LT	3 LT
2-Methylphenol	3.6 LT	3.6 LT	3.6 LT	4 LT
4-Methylphenol	2.8 LT	2.8 LT	2.8 LT	3 LT
2-Nitrophenol	8.2 LT	8.2 LT	8.2 LT	8 LT
2,4-Dimethylphenol	4.4 LT	4.4 LT	4.4 LT	4 LT
2,4-Dichlorophenol	8.4 LT	8.4 LT	8.4 LT	8 LT
4-Chloro-3-Cresol	8.5 LT	8.5 LT	8.5 LT	9 LT
2,4,6-Trichlorophenol	3.6 LT	3.6 LT	3.6 LT	4 LT
2,4,5-Trichlorophenol	2.8 LT	2.8 LT	2.8 LT	3 LT
2,3,6-Trichlorophenol	1.7 LT	1.7 LT	1.7 LT	1.7 LT
2,4-Dinitrophenol	180 LT	180 LT	180 LT	180 LT
4-Nitrophenol	96 LT	96 LT	96 LT	96 LT
Dibenzofuran	5.1 LT	5.1 LT	5.1 LT	5 LT
4,6-Dinitro-2-Cresol	50 ND	50 ND	50 ND	50 ND
Pentachlorophenol	9.1 LT	9.1 LT	9.1 LT	9 LT
PCBs				
PCB 1016	9.1 ND	9.1 ND	9.1 ND	9 ND
PCB 1221	7.2 ND	7.2 ND	7.2 ND	7 ND
PCB 1232	9.9 ND	9.9 ND	9.9 ND	10 ND
PCB 1242	5.2 ND	5.2 ND	5.2 ND	5 ND
PCB 1248	38 ND	38 ND	38 ND	38 ND
PCB 1254	33 ND	33 ND	33 ND	33 ND
PCB 1260	13 ND	13 ND	13 ND	13 ND
PESTICIDES				
Alpha-Benzenehexachloride	5.3 LT	5.3 LT	5.3 LT	5 LT
Beta-Benzenehexachloride	17 LT	17 LT	17 LT	17 LT
Atrazine	5.9 LT	5.9 LT	5.9 LT	6 LT
Lindane	7.2 LT	7.2 LT	7.2 LT	7 LT
Delta-Benzenehexachloride	3 ND	3 ND	3 ND	3 ND
Heptachlor	38 LT	38 LT	38 LT	38 LT
Bromacil	2.9 LT	2.9 LT	2.9 LT	3 LT
Malathion	21 LT	21 LT	21 LT	21 LT
Parathion	37 LT	37 LT	37 LT	37 LT
Aldrin	13 LT	13 LT	13 LT	13 LT
Supona	19 LT	19 LT	19 LT	19 LT
Isodrin	7.8 LT	7.8 LT	7.8 LT	8 LT
Heptachlor Epoxide	28 LT	28 LT	28 LT	28 LT
Chlordane	37 ND	37 ND	37 ND	37 ND
Vapona	8.5 LT	8.5 LT	8.5 LT	9 LT
Endosulfan I	23 LT	23 LT	23 LT	23 LT
2,2-Bis (Para-Chlorophenyl)-1,1-Dichloroethene	14 LT	14 LT	14 LT	14 LT
Dieldrin	26 LT	26 LT	26 LT	26 LT
Endrin Aldehyde	5 LT	5 LT	5 LT	5 LT
Endrin	18 LT	18 LT	18 LT	18 LT
2,2-Bis (Para-Chlorophenyl)-1,1-Dichloroethane	18 LT	18 LT	18 LT	18 LT
Endosulfan II	42 LT	42 LT	42 LT	42 LT
2,2-Bis (Para-Chlorophenyl)-1,1,1-Trichloroethane	18 LT	18 LT	18 LT	18 LT
Endosulfan Sulfate	50 LT	50 LT	50 LT	50 LT
Methoxychlor	11 LT	11 LT	11 LT	11 LT
Mirex	24 LT	24 LT	24 LT	24 LT
Endrin Ketone	6 ND	6 ND	6 ND	6 ND
Toxaphene	17 ND	17 ND	17 ND	17 ND

TABLE ODA-6: Semivolatile Organic Compounds in Ground Water from the ODA

Fort George G. Meade, Maryland

Sample Location ID	ODAMW-1		ODAMW-2		ODAMW-3		93QC-154	
Field Sample ID	O1M0001		O1M0002		O1M0003		Q1XF154Y	
Site Type	WELL		WELL		WELL		FBLK	
Screen Start Depth (ft bgs)	3.5		4		5		-	
Screen End Depth (ft bgs)	13.5		14		15		-	
Media	CGW		CGW		CGW		CGW	
Total/Dissolved							Total	
QC Type							Field Blank	
PHOSPHOROUS CONTAINING								
Dimethylmethyl Phosphate	130	LT	130	LT	130	LT	130	LT
Diisopropylmethyl Phosphonate	21	LT	21	LT	21	LT	21	LT
PHTHALATES								
Dimethyl Phthalate	2.2	LT	2.2	LT	2.2	LT	2	LT
Diethyl Phthalate	5.9	LT	5.9	LT	5.9	LT	6	LT
Di-N-Butyl Phthalate	33	LT	33	LT	33	LT	33	LT
Butylbenzyl Phthalate	28	LT	28	LT	28	LT	28	LT
Bis (2-Ethylhexyl) Phthalate	7.7	LT	7.7	LT	7.7	LT	8	LT
Di-N-Octyl Phthalate	1.5	LT	1.5	LT	1.5	LT	2	LT
POLYNUCLEAR AROMATICS								
Naphthalene	0.5	LT	0.5	LT	0.5	LT	1	LT
2-Methylnaphthalene	1.3	LT	1.3	LT	1.3	LT	1	LT
2-Chloronaphthalene	2.6	LT	2.6	LT	2.6	LT	3	LT
Acenaphthylene	5.1	LT	5.1	LT	5.1	LT	5	LT
Acenaphthene	5.8	LT	5.8	LT	5.8	LT	6	LT
Fluorene	9.2	LT	9.2	LT	9.2	LT	9	LT
Phenanthrene	9.9	LT	9.9	LT	9.9	LT	10	LT
Anthracene	5.2	LT	5.2	LT	5.2	LT	5	LT
Fluoranthene	24	LT	24	LT	24	LT	24	LT
Pyrene	17	LT	17	LT	17	LT	17	LT
Benzo [A] Anthracene	9.8	ND	9.8	ND	9.8	ND	10	ND
Chrysene	7.4	LT	7.4	LT	7.4	LT	7	LT
Benzo [B] Fluoranthene	10	LT	10	LT	10	LT	10	LT
Benzo [K] Fluoranthene	10	LT	10	LT	10	LT	10	LT
Benzo [A] Pyrene	14	LT	14	LT	14	LT	14	LT
Indeno [1,2,3-C,D] Pyrene	21	LT	21	LT	21	LT	21	LT
Dibenz [A,H] Anthracene	12	LT	12	LT	12	LT	12	LT
Benzo [G,H,I] Perylene	15	LT	15	LT	15	LT	15	LT
SULFUR CONTAINING								
4-Chlorophenylmethyl Sulfoxide	15	LT	15	LT	15	LT	15	LT
4-Chlorophenylmethyl Sulfide	10	LT	10	LT	10	LT	10	LT
4-Chlorophenylmethyl Sulfone	5.3	LT	5.3	LT	5.3	LT	5	LT
OTHER								
1,4-Oxathiane	27	LT	27	LT	27	LT	27	LT
Bis (2-Chloroethyl) Ether	0.68	LT	0.68	LT	0.68	LT	1	LT
Dicyclopentadiene	5.5	LT	5.5	LT	5.5	LT	6	LT
Benzyl Alcohol	4	LT	4	LT	4	LT	4	LT
Bis (2-Chloroisopropyl) Ether	5	LT	5	LT	5	LT	5	LT
Dithiane	3.3	LT	3.3	LT	3.3	LT	3	LT
Hexachloroethane	8.3	LT	8.3	LT	8.3	LT	8	LT
Dibromochloropropane	12	LT	12	LT	12	LT	12	LT
Isophorone	2.4	LT	2.4	LT	2.4	LT	2	LT
Bis (2-Chloroethoxy) Methane	6.8	LT	6.8	LT	6.8	LT	7	LT
Benzoic Acid	3.1	ND	3.1	ND	3.1	ND	3	ND
4-Chloroaniline	1	ND	1	ND	1	ND	1	ND
Hexachlorocyclopentadiene	54	LT	54	LT	54	LT	54	LT
2-Nitroaniline	31	ND	31	ND	31	ND	31	ND
3-Nitroaniline	15	LT	15	LT	15	LT	15	LT
4-Chlorophenylphenyl Ether	23	LT	23	LT	23	LT	23	LT
4-Nitroaniline	31	ND	31	ND	31	ND	31	ND
1,2-Diphenylhydrazine	13	LT	13	LT	13	LT	13	LT
2,6-Dinitroaniline	8.8	LT	8.8	LT	8.8	LT	9	LT
4-Bromophenylphenyl Ether	22	LT	22	LT	22	LT	22	LT
3,5-Dinitroaniline	21	LT	21	LT	21	LT	21	LT
Hexachlorobutadiene	8.7	LT	8.7	LT	8.7	LT	9	LT
3,3'-Dichlorobenzidine	5	LT	5	LT	5	LT	5	LT
TOTAL SVOC	0		0		0		0	
Collection Date:	26-Feb-93		24-Feb-93		26-Feb-93		26-Feb-93	
Extraction Date:	07-Mar-93		07-Mar-93		07-Mar-93		07-Mar-93	
Analysis Date:	07-Mar-93		07-Mar-93		07-Mar-93		07-Mar-93	

NOTES:
(1) LT= Less than detection limits; ND= Not detected

Appendix M: Soldiers Lake Analytical Results

Note: The term "LT" indicates that a certified analyte is not detected. The term "ND" is used for analytes that are added to certified methods but have not gone through the certification process. The term "LT" is followed by the certified reporting limit, it does not signify that a compound was actually detected but not included because results were below the Contract Required Detection Limit.

TABLE SL-1: Metals in Surface Water from Soldiers Lake
Fort George G. Meade, Maryland

Site ID	SLSW-1		SLSW-2		94QC-455	
Field Sample ID	S1K0001Y		S1K0002Y		Q1KD455Y	
Site Type	LAKE		LAKE		LAKE	
Start Depth (ft)	0		0		0	
End Depth (ft)	0.5		0.5		0.5	
Media	CSW		CSW		CSW	
Total/Dissolved	Total		Total		Total	
QC Type					Dup. of SLSW-2	
METALS (ug/L)						
Aluminum	119		143		152	
Antimony	60	LT	60	LT	60	LT
Arsenic	2.35	LT	2.35	LT	2.35	LT
Barium	68		58.1		58.5	
Beryllium	1.12	LT	1.12	LT	1.12	LT
Boron	230	LT	230	LT	230	LT
Cadmium	6.78	LT	6.78	LT	6.78	LT
Calcium	22800		19600		19200	
Chromium	16.8	LT	16.8	LT	16.8	LT
Cobalt	25	LT	25	LT	25	LT
Copper	18.8	LT	18.8	LT	18.8	LT
Iron	502		498		501	
Lead	4.47	LT	4.47	LT	4.47	LT
Magnesium	5150		4360		4330	
Manganese	120		114		112	
Mercury	0.1	LT	0.1	LT	0.1	LT
Molybdenum	52.7	LT	52.7	LT	52.7	LT
Nickel	32.1	LT	32.1	LT	32.1	LT
Potassium	3610		3320		2560	
Selenium	2.53	LT	2.53	LT	2.53	LT
Silver	10	LT	10	LT	10	LT
Sodium	93000		44900		43300	
Tellurium	118	LT	118	LT	118	LT
Thallium	125	LT	125	LT	125	LT
Tin	59.9	LT	59.9	LT	59.9	LT
Vanadium	27.6	LT	27.6	LT	27.6	LT
Zinc	32.9		25.9		29	
HEAVY METALS	0		0		0	
TOTAL METALS	125,402		73,019		70,243	
Collection Date	19-Jan-94		18-Jan-94		18-Jan-94	
Extraction Date	13-Feb-94		13-Feb-94		13-Feb-94	
Analysis Date	13-Feb-94		13-Feb-94		13-Feb-94	

Notes:
(1) LT - less than detection limit; ND - not detected
(2) Heavy metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag

TABLE SL-2: Pesticides in Surface Water from Soldiers Lake
Fort George G. Meade, Maryland
Page 1 of 1

Site ID	SLSW-1		SLSW-2		94QC-455	
Field Sample ID	S1K0001Y		S1K0002Y		Q1KD455Y	
Site Type	LAKE		LAKE		LAKE	
Start Depth (ft)	0		0		0	
End Depth (ft)	0.5		0.5		0.5	
Media	CSW		CSW		CSW	
Total/Dissolved	Total		Total		Total	
QC Type					Dup. of SLSW-2	
PESTICIDES (ug/L)						
alpha-BHC	0.003	LT	0.003	LT	0.003	LT
beta-BHC	0.01	LT	0.01	LT	0.01	LT
Lindane	0.008		0.006		0.006	
Chlordane	0.031	LT	0.031	LT	0.031	LT
delta-BHC	0.003	LT	0.003	LT	0.003	LT
Heptachlor	0.003	LT	0.003	LT	0.003	LT
Aldrin	0.007	LT	0.007	LT	0.007	LT
Isodrin	0.003		0.006		0.005	
Heptachlor Epoxide	0.006	LT	0.006	LT	0.006	LT
Toxaphene	1.64	LT	1.64	LT	1.64	LT
Endosulfan I	0.003	LT	0.003	LT	0.003	LT
p,p'-DDE	0.004	LT	0.004	LT	0.004	LT
Dieldrin	0.007	LT	0.007	LT	0.007	LT
Endrin	0.018	LT	0.018	LT	0.018	LT
p,p'-DDD	0.008	LT	0.008	LT	0.008	LT
Endosulfan II	0.008	LT	0.008	LT	0.008	LT
p,p'-DDT	0.003	LT	0.005		0.004	
Endrin Aldehyde	0.05	LT	0.05	LT	0.05	LT
Methoxychlor	0.075	LT	0.075	LT	0.075	LT
Collection Date	19-Jan-94		18-Jan-94		18-Jan-94	
Extraction Date	26-Jan-94		24-Jan-94		24-Jan-94	
Analysis Date	02-Feb-94		26-Jan-94		26-Jan-94	

Notes:
(1) LT - less than detection limit; ND - not detected

Appendix N: Background Soil and Quality Control Analytical Results

TABLE BKG-1: Metals In Background Soils
Fort George G. Meade, Maryland
Page 1 of 4

Site ID	BKG-1	BKG-2	BKG-3	BKG-27	BKG-28	BKG-4	BKG-5	BKG-6	BKG-31
Field Sample ID	B1A0001Y	B1A0002Y	B1A0003Y	B1A0027Y	B1A0028Y	B1A0004Y	B1A0005Y	B1A0006Y	B1A0031Y
Site Type	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL
Start Depth (ft bgs)	0	0	0	2	2	2	2	2	2
End Depth (ft bgs)	3	3	3	3	3	3	3	3	3
Media	CSO	CSO	CSO	CSO	CSO	CSO	CSO	CSO	CSO
Closest Site	ODA	ODA	ODA	ODA	ODA	CFD	CFD	CFD	CFD
METALS (ug/g)									
Aluminum	4680	10500	8220	10500	8560	10300	24900	19600	1240
Antimony	19.6 LT	19.6 LT	19.6 LT	19.6 LT	19.6 LT	19.6 LT	19.6 LT	19.6 LT	19.6 LT
Arsenic	2.5 LT	2.86	2.5 LT	3.61	4.36	3.84	5.02	15.5	2.5 LT
Barium	18.9	36.6	28.4	33.7	24.8	22.2	53.1	44.1	8.21
Beryllium	0.427 LT	0.427 LT	0.427 LT	0.427 LT	0.427 LT	0.427 LT	1.08	1.29	0.427 LT
Boron	12.9	11.8	9.09	6.64 LT	6.64 LT	11.1	17	12.1	6.64 LT
Cadmium	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT
Calcium	99.9	103	95.5	42.5	25.3 LT	25.3 LT	34.4	25.3 LT	25.3 LT
Chromium	7.7	13.6	10.3	12.7	23	18.2	40.2	49.5	4.29
Cobalt	2.5 LT	3.55	2.5 LT	2.5 LT	2.5 LT	2.97	4.96	2.5 LT	2.5 LT
Copper	4.8	5.33	2.84 LT	4.66	12.3	7.64	16.3	22.8	2.84 LT
Iron	5290	10400	5250	12500	21800	16300	42200	51900	3950
Lead	5.16	5.42	6.3	7.05	6.61	4.54	6.69	7.56	1.36
Magnesium	279	776	499	510	297	564	808	251	111
Manganese	19.8	62.9	51.6	17.6	9.87 LT	20.6	86.3	16.8	15.3
Mercury	0.05 LT	0.05 LT	0.05 LT	0.05 LT	0.05 LT	0.05 LT	0.05 LT	0.05 LT	0.05 LT
Molybdenum	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT
Nickel	2.74 LT	7.9	4.45	3.88	2.74 LT	5.86	7.84	5.59	2.74 LT
Potassium	217	555	351	300	480	438	1400	794	131 LT
Selenium	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT
Silver	0.803 LT	0.803 LT	0.803 LT	0.803 LT	0.803 LT	0.803 LT	0.803 LT	0.803 LT	0.803 LT
Sodium	38.7 LT	38.7 LT	38.7 LT	38.7 LT	38.7 LT	38.7 LT	86.4	62.7	38.7 LT
Tellurium	14.9 LT	14.9 LT	14.9 LT	14.9 LT	14.9 LT	14.9 LT	14.9 LT	14.9 LT	14.9 LT
Thallium	34.3 LT	34.3 LT	34.3 LT	34.3 LT	34.3 LT	34.3 LT	34.3 LT	34.3 LT	34.3 LT
Tin	7.43 LT	7.43 LT	7.43 LT	7.43 LT	7.43 LT	7.43 LT	7.43 LT	7.43 LT	7.43 LT
Vanadium	12	23.3	16.4	20.6	36.9	28.3	61.1	101	7.86
Zinc	8.84	18.8	12.4	19.4	14.2	14	21.3	12	3.83
Heavy Metals	13	30	21	27	34	32	61	79	5.7
Grand Total Metals	10656	22526	14554	23976	31259	27741	69750	72896	5342
Collection Date	26-Jan-93	26-Jan-93	26-Jan-93	18-Jan-94	18-Jan-94	28-Jan-93	28-Jan-93	28-Jan-93	24-Jan-94
Extraction Date	18-Feb-93	18-Feb-93	18-Feb-93	03-Feb-94	03-Feb-94	18-Feb-93	18-Feb-93	18-Feb-93	03-Feb-94
Analysis Date	11-Mar-93	11-Mar-93	11-Mar-93	12-Feb-94	12-Feb-94	11-Mar-93	11-Mar-93	11-Mar-93	12-Feb-94

Notes:
(1) LT - less than detection limit; ND - not detected
(2) ft bgs - feet below ground surface
(3) Heavy metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag

TABLE BKG-1: Metals In Background Soils
Fort George G. Meade, Maryland

Site ID	BKG-7	BKG-8	BKG-9	BKG-10	BKG-11	BKG-12	BKG-13	BKG-14
Field Sample ID	B1A0007Y	B1A0008Y	B1A0009Y	B1A0010Y	B1A0011Y	B1A0012Y	B1A0013Y	B1A0014Y
Site Type	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL
Start Depth (ft bgs)	2	2	2	2	2	2	2	2
End Depth (ft bgs)	3	3	3	3	3	3	3	3
Media	CSO	CSO	CSO	CSO	CSO	CSO	CSO	CSO
Closest Site	HHA	HHA	HHA	IL2	IL2	IL2	FTA	FTA
METALS (ug/g)								
Aluminum	4970	11400	8240	7580	1910	27400	2960	7730
Antimony	19.6 LT	19.6 LT	19.6 LT	19.6 LT	19.6 LT	19.6 LT	19.6 LT	19.6 LT
Arsenic	9.87	24.8	2.5 LT	2.5 LT	2.5 LT	2.5 LT	2.5 LT	2.5 LT
Barium	12.9	26.6	35	142	9.49	183	11.3	29.1
Beryllium	0.427 LT	0.427 LT	0.427 LT	0.751	0.427 LT	2.27	0.427 LT	0.427 LT
Boron	8.96	9.25	10.6	21.9	6.64 LT	10.2	11.1	12.8
Cadmium	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT
Calcium	129	232	147	19100	102	1770	63.3	161
Chromium	12.4	18.1	10.6	10.6	11.2	33.1	6.36	11.3
Cobalt	2.5 LT	2.5 LT	2.94	4.08	5.29	18.2	2.5 LT	2.5 LT
Copper	4.94	8.53	4.55	5.29	4.68	13.4	2.84 LT	2.84 LT
Iron	19500	32600	6480	9200	11800	29200	4770	8530
Lead	3.59	5.36	4.17	13.5	5.63	12.4	1.96	4.09
Magnesium	207	457	889	4760	211	3200	389	741
Manganese	11.6	9.87 LT	62.6	1300	95.9	1290	31.3	33.8
Mercury	0.05 LT	0.05 LT	0.05 LT	0.05 LT	0.05 LT	0.05 LT	0.05 LT	0.05 LT
Molybdenum	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT
Nickel	2.74 LT	2.74 LT	6.11	3.97	3.1	19.9	2.74 LT	5.16
Potassium	131 LT	333	408	679	192	1250	241	419
Selenium	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT
Silver	0.803 LT	0.803 LT	0.803 LT	0.803 LT	0.803 LT	0.803 LT	0.803 LT	0.803 LT
Sodium	38.7 LT	38.7 LT	38.7 LT	894	38.7 LT	96.1	38.7 LT	38.7 LT
Tellurium	14.9 LT	14.9 LT	14.9 LT	14.9 LT	14.9 LT	14.9 LT	14.9 LT	14.9 LT
Thallium	34.3 LT	34.3 LT	34.3 LT	34.3 LT	34.3 LT	34.3 LT	34.3 LT	34.3 LT
Tin	7.43 LT	7.43 LT	7.43 LT	7.43 LT	7.43 LT	7.43 LT	7.43 LT	7.43 LT
Vanadium	29.7	31.7	14.6	50.7	14.4	41.8	8.79	15.4
Zinc	5.66	7.5	13.4	14	9.59	60.6	7.07	16.6
Heavy Metals	26	48	21	29	20	68	8.3	21
Grand Total Metals	24906	45154	16329	43780	14374	64601	8501	17709
Collection Date	28-Jan-93	28-Jan-93	28-Jan-93	28-Jan-93	28-Jan-93	28-Jan-93	28-Jan-93	28-Jan-93
Extraction Date	18-Feb-93	18-Feb-93	18-Feb-93	18-Feb-93	18-Feb-93	18-Feb-93	18-Feb-93	18-Feb-93
Analysis Date	11-Mar-93	11-Mar-93	11-Mar-93	11-Mar-93	11-Mar-93	11-Mar-93	11-Mar-93	11-Mar-93

Notes:
(1) LT - less than detection limit; ND - not detected
(2) ft bgs - feet below ground surface
(3) Heavy metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag

TABLE BKG-1: Metals In Background Soils
Fort George G. Meade, Maryland

Site ID	BKG-16	BKG-17	BKG-18	BKG-22	BKG-23	BKG-19	BKG-20	BKG-21	BKG-29	BKG-30
Field Sample ID	B1A0016Y	B1A0017Y	B1A0018Y	B1A0022Y	B1A0023Y	B1A0019Y	B1A0020Y	B1A0021Y	B1A0029Y	B1A0030Y
Site Type	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL
Start Depth (ft bgs)	2	2	2	2	2	2	2	2	2	2
End Depth (ft bgs)	3	3	3	3	3	3	3	3	3	3
Media	CSO	CSO	CSO	CSO	CSO	CSO	CSO	CSO	CSO	CSO
Closest Site	DSY	DSY	DSY	DSY	DSY	ASL	ASL	ASL	ASL	ASL
METALS (ug/g)										
Aluminum	6630	7700	4350	9230	3380	4610	4330	1650	3600	5380
Antimony	19.6 LT	19.6 LT	19.6 LT	19.6 LT	19.6 LT	19.6 LT	19.6 LT	19.6 LT	19.6 LT	19.6 LT
Arsenic	2.5 LT	2.5 LT	2.83	2.5 LT	2.5 LT	2.5 LT	2.5 LT	2.5 LT	2.5 LT	2.5 LT
Barium	31.4	30.1	11.8	37.8	19.3	17.6	35.2	11.1	16.1	17.6
Beryllium	0.427 LT	0.427 LT	0.427 LT	0.427 LT	0.427 LT	0.427 LT	0.427 LT	0.427 LT	0.427 LT	0.427 LT
Boron	6.64 LT	6.64 LT	6.64 LT	6.64 LT	6.64 LT	6.64 LT	6.64 LT	6.64 LT	6.64 LT	6.64 LT
Cadmium	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT
Calcium	52.3	52	25.3 LT	38.5	54	37.9	42.4	30.1	43	44.3
Chromium	28.6	8.63	17.2	14.4	6.19	6.41	5.38	3.94	6.28	11.4
Cobalt	2.5 LT	2.5 LT	2.5 LT	4.74	2.5 LT	2.5 LT	2.5 LT	2.5 LT	2.5 LT	2.5 LT
Copper	23.4	5.3	23.6	6.28	2.84 LT	4.93	5.41	3.65	2.84 LT	2.84 LT
Iron	26500	11100	18400	16300	5370	7580	6690	4990	6100	8570
Lead	5.11	3.94	2.64	5.27	2.54	3.13	2.72	2.06	2.93	3.04
Magnesium	426	554	230	720	369	385	367	126	334	312
Manganese	55.6	49.9	13.4	47.9	49.4	39.4	26	19.4	22.9	24.2
Mercury	0.05 LT	0.05 LT	0.05 LT	0.05 LT	0.05 LT	0.05 LT	0.05 LT	0.05 LT	0.05 LT	0.05 LT
Molybdenum	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT
Nickel	2.74 LT	2.74 LT	2.74 LT	4.71	2.74 LT	2.74 LT	2.74 LT	2.74 LT	2.74 LT	2.74 LT
Potassium	299	242	186	350	131 LT	239	209	131 LT	131 LT	131 LT
Selenium	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT
Silver	0.803 LT	0.803 LT	0.803 LT	0.803 LT	0.803 LT	0.803 LT	0.803 LT	0.803 LT	0.803 LT	0.803 LT
Sodium	38.7 LT	38.7 LT	38.7 LT	38.7 LT	38.7 LT	38.7 LT	38.7 LT	38.7 LT	38.7 LT	38.7 LT
Tellurium	14.9 LT	14.9 LT	14.9 LT	14.9 LT	14.9 LT	14.9 LT	14.9 LT	14.9 LT	14.9 LT	14.9 LT
Thallium	34.3 LT	34.3 LT	34.3 LT	34.3 LT	34.3 LT	34.3 LT	34.3 LT	34.3 LT	34.3 LT	34.3 LT
Tin	7.43 LT	7.43 LT	7.43 LT	7.43 LT	7.43 LT	7.43 LT	7.43 LT	7.43 LT	7.43 LT	7.43 LT
Vanadium	23.3	16.2	16.4	20.1	8.25	12.1	12	8.79	9.51	15.8
Zinc	13.8	15.7	8.25	21.2	8.57	8.27	7.57	3.82	8.1	9.26
Heavy Metals	34	13	23	24	8.7	9.5	8.1	6.0	9.2	14
Grand Total Metals	34089	19778	23262	26801	9267	12944	11733	6849	10143	14388
Collection Date	02-Feb-93	02-Feb-93	02-Feb-93	18-Jan-94	18-Jan-94	02-Feb-93	02-Feb-93	02-Feb-93	24-Jan-94	24-Jan-94
Extraction Date	02-Mar-93	02-Mar-93	02-Mar-93	03-Feb-94	03-Feb-94	02-Mar-93	02-Mar-93	02-Mar-93	03-Feb-94	03-Feb-94
Analysis Date	14-Mar-93	14-Mar-93	14-Mar-93	12-Feb-94	12-Feb-94	14-Mar-93	14-Mar-93	14-Mar-93	12-Feb-94	12-Feb-94

Notes:
(1) LT - less than detection limit; ND - not detected
(2) ft bgs - feet below ground surface
(3) Heavy metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag

TABLE BKG-1: Metals in Background Soils
Fort George G. Meade, Maryland

Site ID	BKG-24		BKG-25		BKG-26	
Field Sample ID	B1A0024Y		B1A0025Y		B1A0026Y	
Site Type	AHOL		AHOL		AHOL	
Start Depth (ft bgs)	2		2		2	
End Depth (ft bgs)	3		3		3	
Media	CSO		CSO		CSO	
Closest Site	SL		SL		SL	
METALS (ug/g)						
Aluminum	4010		3790		3520	
Antimony	19.6	LT	19.6	LT	19.6	LT
Arsenic	2.5	LT	4.62		2.5	LT
Barium	20.8		14.4		33.8	
Beryllium	0.427	LT	0.427	LT	0.427	LT
Boron	6.64	LT	6.64	LT	6.64	LT
Cadmium	1.2	LT	1.2	LT	1.2	LT
Calcium	166		59.9		265	
Chromium	7.77		8.52		11.6	
Cobalt	2.5	LT	2.5	LT	2.5	LT
Copper	3.57		3.7		2.84	LT
Iron	6970		7010		7590	
Lead	2.69		2.89		6.34	
Magnesium	373		266		185	
Manganese	32.2		32.3		40.3	
Mercury	0.05	LT	0.05	LT	0.05	LT
Molybdenum	14.3	LT	14.3	LT	14.3	LT
Nickel	3.16		2.74	LT	2.74	LT
Potassium	176		131	LT	292	
Selenium	0.449	LT	0.449	LT	0.449	LT
Silver	0.803	LT	0.803	LT	0.803	LT
Sodium	38.7	LT	38.7	LT	38.7	LT
Tellurium	14.9	LT	14.9	LT	14.9	LT
Thallium	34.3	LT	34.3	LT	34.3	LT
Tin	7.43	LT	7.43	LT	7.43	LT
Vanadium	11.7		10.2		19.6	
Zinc	8.72		10.2		23.9	
Heavy Metals	14		16		18	
Grand Total Metals	11786		11213		11988	
Collection Date	19-Jan-94		19-Jan-94		19-Jan-94	
Extraction Date	03-Feb-94		03-Feb-94		03-Feb-94	
Analysis Date	12-Feb-94		12-Feb-94		12-Feb-94	

Notes:
(1) LT - less than detection limit; ND - not detected
(2) ft bgs - feet below ground surface
(3) Heavy metals include Sb,As,Be,Cd,Cr,Pb,Hg,Ni,Se,Ag

TABLE BKG-2: Pesticides in Background Soils
Fort George G. Meade, Maryland

Site ID	BKG-1	BKG-2	BKG-3	BKG-27	BKG-28	BKG-4	BKG-5	BKG-6	BKG-31
Field Sample ID	B1A0001Y	B1A0002Y	B1A0003Y	B1A0027Y	B1A0028Y	B1A0004Y	B1A0005Y	B1A0006Y	B1A0031Y
Site Type	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL
Start Depth (ft bgs)	0	0	0	2	2	2	2	2	2
End Depth (ft bgs)	3	3	3	3	3	3	3	3	3
Media	CSO	CSO	CSO	CSO	CSO	CSO	CSO	CSO	CSO
Closest Site	ODA	ODA	ODA	ODA	ODA	CFD	CFD	CFD	CFD
PESTICIDES/PCB COMPOUNDS (ug/g)									
alpha-BHC	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT
beta-BHC	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT
delta-BHC	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT
Lindane	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT
Heptachlor	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT
Aldrin	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT
Endosulfan I	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT
Dieldrin	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT
p,p'-DDE	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT
Endrin	0.007 LT	0.007 LT	0.007 LT	0.007 LT	0.007 LT	0.007 LT	0.007 LT	0.007 LT	0.007 LT
Endosulfan II	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT
p,p'-DDD	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT
p,p'-DDT	0.006	0.008	0.009	0.004 LT	0.004 LT	0.004 LT	0.004 LT	0.004 LT	0.004 LT
Methoxychlor	0.036 LT	0.036 LT	0.036 LT	0.036 LT	0.036 LT	0.036 LT	0.036 LT	0.036 LT	0.036 LT
Isodrin	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT
Heptachlor Epoxide	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.003	0.001 LT	0.001 LT	0.001 LT
Chlordane	0.068 LT	0.068 LT	0.068 LT	0.068 LT	0.068 LT	0.068 LT	0.068 LT	0.068 LT	0.068 LT
Toxaphene	0.226 LT	0.226 LT	0.226 LT	0.226 LT	0.226 LT	0.226 LT	0.226 LT	0.226 LT	0.226 LT
Collection Date	26-Jan-93	26-Jan-93	26-Jan-93	18-Jan-94	18-Jan-94	28-Jan-93	28-Jan-93	28-Jan-93	24-Jan-94
Extraction Date	02-Feb-93	02-Feb-93	02-Feb-93	24-Jan-94	24-Jan-94	02-Feb-93	02-Feb-93	02-Feb-93	31-Jan-94
Analysis Date	15-Feb-93	15-Feb-93	15-Feb-93	28-Jan-94	28-Jan-94	15-Feb-93	15-Feb-93	15-Feb-93	09-Feb-94

Notes:
(1) LT - less than detection limit; ND - not detected
(2) ft bgs - feet below ground surface
(3) Sample depths assume a 10-foot screen (well construction information not available)

TABLE BKG-2: Pesticides in Background Soils
Fort George G. Meade, Maryland

Site ID	BKG-7	BKG-8	BKG-9	BKG-10	BKG-11	BKG-12	BKG-13	BKG-14
Field Sample ID	B1A0007Y	B1A0008Y	B1A0009Y	B1A0010Y	B1A0011Y	B1A0012Y	B1A0013Y	B1A0014Y
Site Type	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL
Start Depth (ft bgs)	2	2	2	2	2	2	2	2
End Depth (ft bgs)	3	3	3	3	3	3	3	3
Media	CSO	CSO	CSO	CSO	CSO	CSO	CSO	CSO
Closest Site	HHA	HHA	HHA	IL2	IL2	IL2	FTA	FTA
PESTICIDES/PCB COMPOUNDS (ug/g)								
alpha-BHC	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT
beta-BHC	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT
delta-BHC	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT
Lindane	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT
Heptachlor	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT
Aldrin	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT
Endosulfan I	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT
Dieldrin	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT
p,p'-DDE	0.003 LT	0.016	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT
Endrin	0.007 LT	0.007 LT	0.007 LT	0.007 LT	0.007 LT	0.007 LT	0.007 LT	0.007 LT
Endosulfan II	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001
p,p'-DDD	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT
p,p'-DDT	0.006	0.016	0.004 LT	0.011	0.004 LT	0.007	0.007	0.015
Methoxychlor	0.036 LT	0.036 LT	0.036 LT	0.036 LT	0.036 LT	0.036 LT	0.036 LT	0.036 LT
Isodrin	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT
Heptachlor Epoxide	0.001 LT	0.1 GT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.016	0.003
Chlordane	0.068 LT	0.068 LT	0.068 LT	0.068 LT	0.068 LT	0.068 LT	0.068 LT	0.068 LT
Toxaphene	0.226 LT	0.226 LT	0.226 LT	0.226 LT	0.226 LT	0.226 LT	0.226 LT	0.226 LT
Collection Date	28-Jan-93	28-Jan-93	28-Jan-93	28-Jan-93	28-Jan-93	28-Jan-93	28-Jan-93	28-Jan-93
Extraction Date	02-Feb-93	02-Feb-93	02-Feb-93	02-Feb-93	02-Feb-93	02-Feb-93	02-Feb-93	02-Feb-93
Analysis Date	15-Feb-93	15-Feb-93	15-Feb-93	15-Feb-93	15-Feb-93	15-Feb-93	15-Feb-93	15-Feb-93

Notes: LT - Less than detection limit; ND - Not detected

TABLE BKG-2: Pesticides in Background Soils
Fort George G. Meade, Maryland

Site ID	BKG-16	BKG-17	BKG-18	BKG-22	BKG-23	BKG-19	BKG-20	BKG-21	BKG-29	BKG-30
Field Sample ID	B1A0016Y	B1A0017Y	B1A0018Y	B1A0022Y	B1A0023Y	B1A0019Y	B1A0020Y	B1A0021Y	B1A0029Y	B1A0030Y
Site Type	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL	AHOL
Start Depth (ft bgs)	3	2	2	2	2	2	2	2	2	2
End Depth (ft bgs)	3	3	3	3	3	3	3	3	3	3
Media	CSO	CSO	CSO	CSO	CSO	CSO	CSO	CSO	CSO	CSO
Closest Site	DSY	DSY	DSY	DSY	DSY	ASL	ASL	ASL	ASL	ASL
PESTICIDES/PCB COMPOUNDS (ug/g)										
alpha-BHC	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT
beta-BHC	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT
delta-BHC	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT	0.008 LT
Lindane	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT
Heptachlor	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT
Aldrin	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT
Endosulfan I	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT
Dieldrin	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT	0.002 LT
p,p'-DDE	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT
Endrin	0.007 LT	0.007 LT	0.007 LT	0.007 LT	0.007 LT	0.007 LT	0.007 LT	0.007 LT	0.007 LT	0.007 LT
Endosulfan II	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT
p,p'-DDD	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT
p,p'-DDT	0.004 LT	0.004 LT	0.004 LT	0.004 LT	0.004 LT	0.004 LT	0.004 LT	0.004 LT	0.004 LT	0.004 LT
Methoxychlor	0.036 LT	0.036 LT	0.036 LT	0.036 LT	0.036 LT	0.036 LT	0.036 LT	0.036 LT	0.036 LT	0.036 LT
Isodrin	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT	0.003 LT
Heptachlor Epoxide	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT	0.001 LT
Chlordane	0.068 LT	0.068 LT	0.068 LT	0.068 LT	0.068 LT	0.068 LT	0.068 LT	0.068 LT	0.068 LT	0.068 LT
Toxaphene	0.226 LT	0.226 LT	0.226 LT	0.226 LT	0.226 LT	0.226 LT	0.226 LT	0.226 LT	0.226 LT	0.226 LT
Collection Date	02-Feb-93	02-Feb-93	02-Feb-93	18-Jan-94	18-Jan-94	02-Feb-93	02-Feb-93	02-Feb-93	24-Jan-94	24-Jan-94
Extraction Date	04-Feb-93	04-Feb-93	04-Feb-93	24-Jan-94	24-Jan-94	04-Feb-93	04-Feb-93	04-Feb-93	31-Jan-94	31-Jan-94
Analysis Date	12-Feb-93	12-Feb-93	12-Feb-93	28-Jan-94	28-Jan-94	12-Feb-93	12-Feb-93	12-Feb-93	09-Feb-94	09-Feb-94

Notes: LT - Less than detection limit; ND - Not detected

TABLE BKG-2: Pesticides in Background Soils
Fort George G. Meade, Maryland

Site ID	BKG-24		BKG-25		BKG-26	
Field Sample ID	B1A0024Y		B1A0025Y		B1A0026Y	
Site Type	AHOL		AHOL		AHOL	
Start Depth (ft bgs)	2		2		2	
End Depth (ft bgs)	3		3		3	
Media	CSO		CSO		CSO	
Closest Site	SL		SL		SL	
PESTICIDES/PCB COMPOUNDS (ug/g)						
alpha-BHC	0.003	LT	0.003	LT	0.003	LT
beta-BHC	0.008	LT	0.008	LT	0.008	LT
delta-BHC	0.008	LT	0.008	LT	0.008	LT
Lindane	0.001	LT	0.001	LT	0.001	LT
Heptachlor	0.002	LT	0.002	LT	0.002	LT
Aldrin	0.001	LT	0.001	LT	0.001	LT
Endosulfan I	0.001	LT	0.001	LT	0.001	LT
Dieldrin	0.002	LT	0.002	LT	0.002	LT
p,p'-DDE	0.003	LT	0.003	LT	0.003	LT
Endrin	0.007	LT	0.007	LT	0.007	LT
Endosulfan II	0.001	LT	0.001	LT	0.001	LT
p,p'-DDD	0.003	LT	0.003	LT	0.003	LT
p,p'-DDT	0.004	LT	0.004	LT	0.004	LT
Methoxychlor	0.036	LT	0.036	LT	0.036	LT
Isodrin	0.003	LT	0.003	LT	0.003	LT
Heptachlor Epoxide	0.001	LT	0.001	LT	0.001	LT
Chlordane	0.068	LT	0.068	LT	0.068	LT
Toxaphene	0.226	LT	0.226	LT	0.226	LT
Collection Date	19-Jan-94		19-Jan-94		19-Jan-94	
Extraction Date	26-Jan-94		26-Jan-94		26-Jan-94	
Analysis Date	09-Feb-94		09-Feb-94		09-Feb-94	

Notes: LT - Less than detection limit; ND - Not detected

TABLE QC-1: Trip Blanks for Fort George G. Meade, Maryland

Site Location ID	93QC-300	93QC-301	93QC-302	93QC-350	93QC-351	93QC-352
Field Sample ID	Q1XT300Y	Q1XT301Y	Q1XT302Y	Q1XT350Y	Q1XT351Y	Q1XT352Y
Site Type	TRIP	TRIP	TRIP	TRIP	TRIP	TRIP
Media	CSW	CSW	CSW	CSW	CSW	CSW
Associated COC Number	7	10	11/12	15/16	18/19	20/21
Associated Areas	HHA	ASL	ASL	FTA	DSY/ODA	ODA/CFD
QC Type	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank
VOLATILE ORGANICS (ug/L)						
AROMATICS						
Benzene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Toluene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Ethylbenzene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,3-Dimethylbenzene / M-Xylene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Xylenes	2 LT	2 LT	2 LT	2 LT	2 LT	2 LT
Styrene	5 ND	5 ND	5 ND	5 ND	5 ND	5 ND
CHLORINATED AROMATICS						
Chlorobenzene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Dichlorobenzene, Nonspecific	2 LT	2 LT	2 LT	2 LT	2 LT	2 LT
1,3-Dichlorobenzene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
HALOGENATED AROMATICS						
Chloromethane	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT
Bromomethane	14 LT	14 LT	14 LT	14 LT	14 LT	14 LT
Chloroethene / Vinyl Chloride	12 LT	12 LT	12 LT	12 LT	12 LT	12 LT
Chloroethane	8 LT	8 LT	8 LT	8 LT	8 LT	8 LT
Methylene Chloride	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,1-Dichloroethylene / 1,1-Dichloroethene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,1-Dichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,2-Dichloroethylenes (Cis And Trans Isomers)	5 LT	5 LT	5 LT	5 LT	5 LT	5 LT
Chloroform	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,2-Dichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,1,1-Trichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Carbon Tetrachloride	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Bromodichloromethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,2-Dichloropropane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Trichloroethylene / Trichloroethene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,3-Dichloropropane	4.8 LT	4.8 LT	4.8 LT	4.8 LT	4.8 LT	4.8 LT
Dibromochloromethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,1,2-Trichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
2-Chloroethylvinyl Ether / (2-Chloroethoxy) Ethene	3.5 LT	3.5 LT	3.5 LT	3.5 LT	3.5 LT	3.5 LT
Bromoform	11 LT	11 LT	11 LT	11 LT	11 LT	11 LT
1,1,2,2-Tetrachloroethane	1.5 LT	1.5 LT	1.5 LT	1.5 LT	1.5 LT	1.5 LT
Tetrachloroethylene / Tetrachloroethene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Carbon Disulfide	5 ND	5 ND	5 ND	5 ND	5 ND	5 ND
Cis-1,3-Dichloropropylene / Cis-1,3-Dichloropropene	5 ND	5 ND	5 ND	5 ND	5 ND	5 ND
Trans-1,3-Dichloropropene	5 ND	5 ND	5 ND	5 ND	5 ND	5 ND
WATER SOLUBLES						
Acetone	8 LT	8 LT	8 LT	8 LT	8 LT	8 LT
Methylethyl Ketone / 2-Butanone	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT
Methylisobutyl Ketone/4-Methyl-2-Pentanone	1.4 LT	1.4 LT	1.4 LT	1.4 LT	1.4 LT	1.4 LT
Methyl-N-Butyl Ketone / 2-Hexanone	1 ND	1 ND	1 ND	1 ND	1 ND	1 ND
OTHER						
Acrylonitrile	8.4 LT	8.4 LT	8.4 LT	8.4 LT	8.4 LT	8.4 LT
Trichlorofluoromethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Acetic Acid, Vinyl Ester / Vinyl Acetate	1 ND	1 ND	1 ND	1 ND	1 ND	1 ND
Collection Date:	29-Jan-93	10-Feb-93	11-Feb-93	18-Feb-93	23-Feb-93	26-Feb-93
Extraction Date:	09-Feb-93	22-Feb-93	22-Feb-93	04-Mar-93	06-Mar-93	07-Mar-93
Analysis Date:	09-Feb-93	22-Feb-93	22-Feb-93	04-Mar-93	06-Mar-93	07-Mar-93

Notes:
LT = less than detection limit; ND = Not Detected

TABLE QC-1: Trip Blanks for Fort George G. Meade, Maryland

Site Location ID	93QC-353	93QC-354	93QC-355	93QC-356	93QC-357	93QC-358
Field Sample ID	Q1XT353Y	Q1XT354Y	Q1XT355Y	Q1XT356Y	Q1XT357Y	Q1XT358Y
Site Type	TRIP	TRIP	TRIP	TRIP	TRIP	TRIP
Media	CSW	CSW	CSW	CSW	CSW	CSW
Associated COC Number	22/23	24	25	26	27	29
Associated Areas	ASL	ASL	ASL	ASL/DSY	ASL	ASL
QC Type	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank
VOLATILE ORGANICS (ug/L)						
AROMATICS						
Benzene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Toluene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Ethylbenzene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,3-Dimethylbenzene / M-Xylene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Xylenes	2 LT	2 LT	2 LT	2 LT	2 LT	2 LT
Styrene	5 ND	5 ND	5 ND	5 ND	5 ND	5 ND
CHLORINATED AROMATICS						
Chlorobenzene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Dichlorobenzene, Nonspecific	2 LT	2 LT	2 LT	2 LT	2 LT	2 LT
1,3-Dichlorobenzene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
HALOGENATED AROMATICS						
Chloromethane	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT	1.2 LT
Bromomethane	14 LT	14 LT	14 LT	14 LT	14 LT	14 LT
Chloroethene / Vinyl Chloride	12 LT	12 LT	12 LT	12 LT	12 LT	12 LT
Chloroethane	8 LT	8 LT	8 LT	8 LT	8 LT	8 LT
Methylene Chloride	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,1-Dichloroethylene / 1,1-Dichloroethene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,1-Dichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,2-Dichloroethylenes (Cis And Trans Isomers)	5 LT	5 LT	5 LT	5 LT	5 LT	5 LT
Chloroform	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,2-Dichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,1,1-Trichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Carbon Tetrachloride	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Bromodichloromethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,2-Dichloropropane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Trichloroethylene / Trichloroethene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,3-Dichloropropane	4.8 LT	4.8 LT	4.8 LT	4.8 LT	4.8 LT	4.8 LT
Dibromochloromethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
1,1,2-Trichloroethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
2-Chloroethylvinyl Ether / (2-Chloroethoxy) Ethene	3.5 LT	3.5 LT	3.5 LT	3.5 LT	3.5 LT	3.5 LT
Bromoform	11 LT	11 LT	11 LT	11 LT	11 LT	11 LT
1,1,2,2-Tetrachloroethane	1.5 LT	1.5 LT	1.5 LT	1.5 LT	1.5 LT	1.5 LT
Tetrachloroethylene / Tetrachloroethene	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Carbon Disulfide	5 ND	5 ND	5 ND	5 ND	5 ND	5 ND
Cis-1,3-Dichloropropylene / Cis-1,3-Dichloropropene	5 ND	5 ND	5 ND	5 ND	5 ND	5 ND
Trans-1,3-Dichloropropene	5 ND	5 ND	5 ND	5 ND	5 ND	5 ND
WATER SOLUBLES						
Acetone	8 LT	8 LT	8 LT	8 LT	8 LT	8 LT
Methylethyl Ketone / 2-Butanone	10 LT	10 LT	10 LT	10 LT	10 LT	10 LT
Methylisobutyl Ketone/4-Methyl-2-Pentanone	1.4 LT	1.4 LT	1.4 LT	1.4 LT	1.4 LT	1.4 LT
Methyl-N-Butyl Ketone / 2-Hexanone	1 ND	1 ND	1 ND	1 ND	1 ND	1 ND
OTHER						
Acrylonitrile	8.4 LT	8.4 LT	8.4 LT	8.4 LT	8.4 LT	8.4 LT
Trichlorofluoromethane	1 LT	1 LT	1 LT	1 LT	1 LT	1 LT
Acetic Acid, Vinyl Ester / Vinyl Acetate	1 ND	1 ND	1 ND	1 ND	1 ND	1 ND
Collection Date:	01-Mar-93	03-Mar-93	04-Mar-93	18-Mar-93	22-Mar-93	24-Mar-93
Extraction Date:	07-Mar-93	07-Mar-93	16-Mar-93	01-Apr-93	01-Apr-93	05-Apr-93
Analysis Date:	08-Mar-93	08-Mar-93	16-Mar-93	01-Apr-93	01-Apr-93	05-Apr-93

Notes:
LT = less than detection limit; ND = Not Detected

TABLE QC-1: Trip Blanks for Fort George G. Meade, Maryland

Site Location ID	93QC-359		93QC-360		93QC-361		93QC-362	
Field Sample ID	Q1XT359Y		Q1XT360Y		Q1XT361Y		QAXT362Y	
Site Type	TRIP		TRIP		TRIP		TRIP	
Media	CSW		CSW		CSW		CSW	
Associated COC Number	28		30		31		28	
Associated Areas	ASL		ASL		ASL		CFD	
QC Type	Trip Blank		Trip Blank		Trip Blank		Trip Blank	
VOLATILE ORGANICS (ug/L)								
AROMATICS								
Benzene	1	LT	1	LT	1	LT	1	LT
Toluene	1	LT	1	LT	1	LT	1	LT
Ethylbenzene	1	LT	1	LT	1	LT	1	LT
1,3-Dimethylbenzene / M-Xylene	1	LT	1	LT	1	LT	1	LT
Xylenes	2	LT	2	LT	2	LT	2	LT
Styrene	5	ND	5	ND	5	ND	5	ND
CHLORINATED AROMATICS								
Chlorobenzene	1	LT	1	LT	1	LT	1	LT
Dichlorobenzene, Nonspecific	2	LT	2	LT	2	LT	2	LT
1,3-Dichlorobenzene	1	LT	1	LT	1	LT	1	LT
HALOGENATED AROMATICS								
Chloromethane	1.2	LT	1.2	LT	1.2	LT	1.2	LT
Bromomethane	14	LT	14	LT	14	LT	14	LT
Chloroethene / Vinyl Chloride	12	LT	12	LT	12	LT	12	LT
Chloroethane	8	LT	8	LT	8	LT	8	LT
Methylene Chloride	1	LT	1	LT	1	LT	1	LT
1,1-Dichloroethylene / 1,1-Dichloroethene	1	LT	1	LT	1	LT	1	LT
1,1-Dichloroethane	1	LT	1	LT	1	LT	1	LT
1,2-Dichloroethylenes (Cis And Trans Isomers)	5	LT	5	LT	5	LT	5	LT
Chloroform	1	LT	1	LT	1	LT	1	LT
1,2-Dichloroethane	1	LT	1	LT	1	LT	1	LT
1,1,1-Trichloroethane	1	LT	1	LT	1	LT	1	LT
Carbon Tetrachloride	1	LT	1	LT	1	LT	1	LT
Bromodichloromethane	1	LT	1	LT	1	LT	1	LT
1,2-Dichloropropane	1	LT	1	LT	1	LT	1	LT
Trichloroethylene / Trichloroethene	1	LT	1	LT	1	LT	1	LT
1,3-Dichloropropane	4.8	LT	4.8	LT	4.8	LT	4.8	LT
Dibromochloromethane	1	LT	1	LT	1	LT	1	LT
1,1,2-Trichloroethane	1	LT	1	LT	1	LT	1	LT
2-Chloroethylvinyl Ether / (2-Chloroethoxy) Ethene	3.5	LT	3.5	LT	3.5	LT	3.5	LT
Bromoform	11	LT	11	LT	11	LT	11	LT
1,1,2,2-Tetrachloroethane	1.5	LT	1.5	LT	1.5	LT	1.5	LT
Tetrachloroethylene / Tetrachloroethene	1	LT	1	LT	1	LT	1	LT
Carbon Disulfide	5	ND	5	ND	5	ND	5	ND
Cis-1,3-Dichloropropylene / Cis-1,3-Dichloropropene	5	ND	5	ND	5	ND	5	ND
Trans-1,3-Dichloropropene	5	ND	5	ND	5	ND	5	ND
WATER SOLUBLES								
Acetone	8	LT	8	LT	8	LT	8	LT
Methylethyl Ketone / 2-Butanone	10	LT	10	LT	10	LT	10	LT
Methylisobutyl Ketone/4-Methyl-2-Pentanone	1.4	LT	1.4	LT	1.4	LT	1.4	LT
Methyl-N-Butyl Ketone / 2-Hexanone	1	ND	1	ND	1	ND	1	ND
OTHER								
Acrylonitrile	8.4	LT	8.4	LT	8.4	LT	8.4	LT
Trichlorofluoromethane	1	LT	1	LT	1	LT	1	LT
Acetic Acid, Vinyl Ester / Vinyl Acetate	1	ND	1	ND	1	ND	1	ND
Collection Date:	23-Mar-93		25-Mar-93		26-Mar-93		15-Apr-93	
Extraction Date:	01-Apr-93		05-Apr-93		05-Apr-93		27-Apr-93	
Analysis Date:	01-Apr-93		05-Apr-93		05-Apr-93		27-Apr-93	

Notes:
LT = less than detection limit; ND = Not Detected

Appendix O: Investigation-Derived Waste

Appendix O: Investigation-Derived Waste

This topic paper discusses the management of investigation-derived wastes (IDW) during the Remedial Investigation Addendum (RIA) and Site Inspection Addendum (SIA) investigations conducted at Fort George G. Meade (FGGM). This paper also addresses MDE and EPA comments on IDW.

The SIA/RIA Work Plan stated that only drilling spoils with a PID reading of greater than 10 ppm would be contained in drums, however, due to comments from the EPA and MDE, we contained all drill spoils. At the request of USAEC, the purge water was returned to the ground. The rationale for discharging purge water was that, for the unconfined aquifer, the ground water was shallow and the contaminants would not cause any further contamination. For the confined aquifer, discharge of purge water was conducted because, based on previous laboratory analyses, the deep aquifer was uncontaminated relative to the shallow aquifer, and, therefore, its discharge would not cause cross-contamination or further contamination.

The drilling spoils drums were labeled with site name, well number of source, contents, date collected, and number (n) of total number of drums (m) for the boring (n/m). The drums were initially stored at their source locations and were then moved onto pallets in a staging area at the Active Sanitary Landfill (ASL). The only drums not to be moved to the ASL were the drums from the Ordnance Demolition Area (ODA). These drums were not moved for safety reasons; the area will require clearance from a UXO or EOD specialist before a truck can be used to move the drums.

The number of drums collected, for each area, was as follows:

- Active Sanitary Landfill (ASL): 32 drums from MW-101D, 3 drums from MW-103, 2 drums from MW-102, and 3 drums from MW-104.

- Ordnance Demolition Area (ODA): 6 drums total from wells ODAMW-1, ODAMW-2, and ODAMW-3.

- Helicopter Hangar Area (HHA): 2 drums from HHA-6.

- DPDO Salvage Yard and Transformer Storage Area (DSY): 9 drums total from MW-200 and MW-201.

- Fire Training Area (FTA): 11 drums total from FTAMW-1, FTAMW-2, and FTAMW-3.

At the conclusion of the field program, the drums were inventoried and sampled. A representative number of samples was collected from each location by compositing materials from two or three drums, with the exception of one sampling location where only one drum was sampled. The samples were logged into the field books by their location, the individual drum, and the depth of the sample from the drum.

Selection of drums to sample, where multiple drums were present, was a function of accessibility and the drums' contents. The rationale was to composite individual grabs from the same location to ensure that materials from one location did not mix with materials from another location. Larger numbers of samples were obtained from locations where larger numbers of drums were generated, specifically at the ASL and the FTA. For a given location, a random selection of drums was made, then individual grab samples were obtained at different depths to help ensure that a representative sample was collected. Grab samples of soil were collected using either an auger or stainless-steel spoon and mixing it in a stainless-steel bowl. All sampling and compositing equipment was decontaminated between samples.

Several drums of decontamination water were generated. Grab samples of water were collected by dipping the sample bottles into the drums. Several drums contained plastic sheeting used to construct decontamination pads or bentonite/cement; these were not sampled.

A total of five composite soil samples and two composite aqueous samples were collected for analysis of TCLP for metals, pesticides, volatile organics, semivolatile organics, and herbicides. A summary of the samples is provided in Table 1. The results of the chemical data are attached. All detected analytes were below their Maximum Concentration of Contaminants for the Toxicity Characteristic in the Federal register. The waste was not considered as potential RCRA-listed waste, or applicable for the land-ban restrictions, because none of the wells were drilled in a source area and were, therefore, extremely unlikely to contain listed wastes.

To ensure that the waste spoils were handled in accordance with Maryland's state requirements, ADL contacted Fred Keer of the Maryland Department of the Environment, Division of Waste Management and sent the attached letter. MDE provided the USAEC with approval to discard the drum contents.

References

- *Management of Investigation Derived Wastes during Site Inspections*, OSRR Directive 9345.3-02, May 1991.
- *Guide to Management of Investigation-Derived Wastes, Quick Reference Fact Sheet*, Publication 9345.3-O3FS, April 1992.
- *Table 1 Maximum Concentration of Contaminants for the Toxicity Characteristic*, 40 CFR 261.24.